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Investigations in Erosion Control and Reclamation of Eroded Land

at the

Blackland Conservation Experiment Station, Temple, Tex. 1931–41

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UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
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Back of every great achievement is knowledge. Back of every successful human undertaking must be exact data for proper guidance of the enterprise.

Farmers of America have undertaken the gigantic task of producing more foods, fats, and fibers than America has ever produced before—vital crops needed for war. These crops—oils and fats, milk and cheese, meat and eggs, and many others—are as essential to winning the war as are tanks, planes, warships, and ammunition. Food is a first weapon of war. And our production goals will likely have to be even higher in order to meet our ever-increasing needs.

This puts a tremendous responsibility upon American farmers and a burden on their equipment. But American farmers know how to farm and how to get good crop yields.

It puts a strain on our farm land, too. We do not have enough good land left under cultivation in America to do this job, *unless we use every means at our disposal to increase yields and to protect the soil while we are doing so.* And even then, we may have to bring some new land into cultivation—by irrigation, perhaps, or by drainage. Even some of the older erosion-impoverished lands may have to be put back into use through application of intensive measures for control of erosion.

Unless we take these precautions we must face such unpleasant alternatives as these: (1) We may fail to meet our war crop-production goals, and thereby prolong the conflict, or (2) much land may be laid waste by hazardous overcropping, and in this case the devastation, while less spectacular, would be no less real than that caused by bombs and shells.

These considerations put a premium on knowledge: That special kind of knowledge which will enable farmers to meet the vital war goals without so impoverishing their land that it cannot produce the even greater crops which the next succeeding year of war may demand.

This knowledge, supplementing the training and experience of American farmers as a group, points the way to a successful carrying out of the vital war crop-production enterprise upon which they have embarked and upon which America and a great deal of the world depend, today and tomorrow.

This publication contains much especially significant knowledge as it has been developed through study and research for the Blacklands area of Texas. Crop yields are being notably increased by conservation farming methods. This report describes the methods farmers are using to achieve their war goals without abusing their land.

Briefly, it is a report of technical advances in conservation farming of more than 10 years, showing not only methods used, but also the basic factors involved. They are set down clearly, and they are authenticated by figures, plates, tables, and other data, concisely presented.

In effect, this report is a manual or handbook for technicians and for technicians only. Any soil and water conservation technician working in the Blacklands area of Texas has in his copy of this report a handy pocket guide for determining degrees of slope for terrace channels on certain soils, the vertical fall between terrace crests, the expectancy of protection to be derived from various kinds of cover crops on different soils and slopes, the amount of water likely to be conserved from the average rains for crop use under various conditions of slope and soil treatment, and so on. Other reports are planned to provide the same data for guidance of technicians in other important farming regions.

They will contain a very large amount of quantitative data that will be particularly useful to agricultural engineers and crop specialists. In these hundreds of measurements, engineers have for the first time available data for computing the probable amount of water that will be delivered by various types of rains falling on the more common surface conditions over large areas of land in the Blacklands of Texas. And by interpolation, the same data, considered coordinately with similar data from other regions' experiments can be used in making estimates of considerable reliability for many intervening land conditions.

These reports in the hands of the technicians who work with the farmers will be the means of putting into effect on the land more rapidly and more effectively than ever the essential measures to increase production for war.

H. H. BENNETT,
Chief, Soil Conservation Service.

Washington, D. C.

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DEPARTMENT OF AGRICULTURE
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Investigations in Erosion Control and Reclamation of Eroded Land at the Blackland Conservation Experiment Station, Temple, Tex., 1931–41[1]

By H. O. HILL, *project supervisor*, and W. J. PEEVY, *associate soil conservationist*, A. G. MCCALL, *senior soil conservationist*, and F. G. BELL, *chief, Erosion Control Practices Division Research, Soil Conservation Service* [2]

THE UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

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SUMMARY

The Blacklands area presents several unique problems in soil conservation not found elsewhere in the United States. The 15 million acres served by the Blackland Conservation Experiment Station were originally covered with predominantly dark, heavy prairie soil. Unwise agricultural practices and other factors have transformed the cover of these Blackland prairies so that today there are relatively few virgin meadows remaining. The greater part of this prairie land has been brought under cultivation within the last 50 or 60 years, the principal cash crop being cotton, with corn, small grains, and sorghums as important secondary crops. Nearly all of the cultivated crops, such as corn and cotton, are grown in rows parallel to fences or turn rows, without regard to the slope of the land. This practice has been conducive to severe sheet erosion, which is often followed by gullies. An erosion reconnaissance survey made in 1934 revealed the fact that only about 10 percent of the area was free

[1] Submitted for publication March 1943.
[2] Acknowledgment is made of the work of previous investigators assigned to this station; namely, H. V. Geib, G. W. Musgrave, R. A. Norton, E. B. Deeter, P. L. Hopkins, and C. H. McDowell. Acknowledgment is also made of the work of the present station staff, particularly L. T. Pruitt, A. M. Griffin, Walter McKensie, and Dorothy M. Cast.

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from erosion damage. Moderate sheet and gully erosion was found to be prevalent on 39 percent of the area, and 51 percent was found to be severely damaged by sheet erosion and gullying.

Although a majority of the fields are only gently rolling, the Blacklands present a detailed problem in soil conservation that is distinctly different from other problem areas. The soils are high in colloidal clay and subject to extensive swelling and contraction under the influence of alternate wetting and drying. The percentage of rainfall lost as runoff from the typical rainstorm is high, creating an erosion hazard on even the most moderate slopes. During dry weather the soil contracts, producing cracks which may develop into severe gullies before they are closed by the swelling of the wet soil. The problem is further complicated by the fact that these Blackland soils have not responded sufficiently to applications of commercial fertilizers to make such applications practical. However, they have shown a marked response to additions of organic matter in the form of barnyard manure or crops plowed under as green manure. The presence of cotton root-rot organisms in these soils makes it very difficult to grow legumes for green manure, nor are there any of the cultivated perennial meadow grasses available that are capable of producing economic protective cover. Lack of suitable legumes and grasses for meadow places a drastic limitation on the types and lengths of rotation that may be employed for conservation purposes. Winter oats have been found to be the most successful grass-type crop available for use in rotations with corn or cotton and for erosion-resistant strip plantings. As a consequence, more use and dependence must be placed upon mechanical controls and tillage methods than is commonly required under less limited conditions. The results of the 10 years' research at the Blacklands station give evidence that many conservation practices may be applied effectively to the Blacklands and similar areas. The practices under investigation include crop rotations, vegetative cover, contour cultivation, strip cropping, and terraces.

During the 11 years of record, the control plot planted continuously to cotton lost 226 tons of soil per acre (20.5 tons a year). Three rainstorms caused 27 percent of this loss and 14 storms accounted for 52 percent of the total soil loss. The amount of soil loss is influenced by the intensity of the storm, the antecedent rains, the presence of or absence of plant cover, and the physical condition of the surface soil. Rainfall on a wet, tightly compacted soil caused almost 5 times greater loss than one of similar amount and intensity falling on a moist, loosely packed surface. A moderate rainfall of high intensity falling on dry loose soil that had been subjected to flat cultivation produced much higher runoff and soil loss than a similar rain falling on similar soil that had been left in a cloddy moist condition. These records, together with other experimental data, furnish ample evidence of the fact that modifications of cultural practices can be made to play an important part in the management of the soils of the Texas Blackland area.

Established plant cover, such as Bermuda grass, was the most effective means of reducing runoff and controlling erosion. Of the cultivated plants, oats have given effective protection, due largely to the fact that this crop is at its maximum-growth period during the spring months when protection is most needed.

Contrary to the findings at the other stations, the control plots on the Blackland soils have indicated a slight increase in runoff and soil loss for the shorter slopes. The terraced fields, however, have shown a fairly consistent increase in soil loss with increase in the length of the slope between the terrace ridges.

Runoff from the desurfaced plot has been about 2½ times that from the surface soil and soil loss about 1½ times greater.

Contour farming without strip cropping or terraces increased the danger of concentrating runoff water and the formation of severe washes that eventually developed into gullies.

The cost of farming on the contour or parallel with the terraces was slightly greater than with the rows across the terraces parallel with the field boundaries but the latter practice materially lowered the terrace height and resulted in overtopping on numerous occasions.

The better control exhibited by the rotated crops, as compared with continuous corn, was due probably to the inclusion of oats in the rotation. No residual effect of the oats on the succeeding crop was apparent, indicating that the favorable effect of the rotation was due only to the cover afforded by the oats when it actually occupied the ground.

Field-plot data show that crop rotations containing small grains are effective in reducing soil and water losses and that this saving is greatly enhanced by strip cropping when the proper sequence is followed. Further data indicate that the combination of strip cropping with terraces is slightly more effective than either of these soil-conserving measures used alone.

Terraces with vertical intervals of 2.5 to 3.5 feet gave satisfactory performance where the maximum land slope was limited to a little over 5 percent. Data from terraces of various lengths indicate there is no optimum length from the standpoint of soil and water losses. The distance to a desirable and efficient terrace-outlet channel will determine the length of the terrace. Soil losses from the variable grade terraces were slightly less than from those of uniform grade. Maintenance of terraces can be secured by the adaptation of normal tillage practices without the necessity for employing special and expensive operations. All the machinery normally used in this area can be used satisfactorily for farming terraced lands, although the operation of grain drills, binders, and ganged harrows could be improved by designing them for greater flexibility. Experimental evidence and observations lead to the conclusion that wide, shallow well-sodded natural depressions extending up into the cultivated field offer the best solution for terrace-outlet problems. A limited study has been made of various grasses which showed promise of effective used in vegetated outlets.

The problems of soil conservation involve the rebuilding of severely eroded areas as well as the reduction of soil losses. Results from this station have shown that, in general, Blackland soils respond satisfactorily to additions of organic matter. Hubam clover and selected strains of cowpeas offer possibilities for soil-building purposes, one year's results on eroded Austin clay showing an increase in the yield of cotton following Hubam clover, as compared with cotton after corn. The yield of corn after Hubam clover was about the same as corn after cotton. Experience has shown that land too severely eroded to remain in cultivation can best be utilized in this area by revegetation to grasses. One hundred twenty species of grasses are under observation at this station to determine the possibilities for their use in soil conservation.

INTRODUCTION

This publication presents the results of 10 years' work in the determination of the cause of soil erosion and the development of soil and water conservation practices at the Blackland Soil and Water Conservation Experiment Station. This station, located about 3 miles south of Temple, Tex., is one of the 10 original stations (fig. 1) established under authority of the Buchanan amendment to the agricultural appropriation bill for the fiscal year 1930 (*10*).[3]

Soil wastage has progressively increased in American since the first colonists began intensive cultivation of agricultural crops. Even though many areas were laid bare through its results and the settlers moved on to virgin land, the far-reaching effects of serious soil erosion on the national welfare was not recognized until about 1911. In this year, a soil survey report of Fairfield County, S. C. was published, which disclosed the fact that 90,000 acres of formerly cultivated land had been cut to pieces by gullies, and that an additional 46,000 acres, which were formerly rich bottom land, had been converted into swampy meadow as a result of the products of erosion. In 1923, the severity of erosion was recognized in Missouri and the agricultural experiment station published a research bulletin on this subject (*5*). About the same time, the Texas Agricultural Experiment Station also published a bulletin giving the results of the work at the Spur substation (*4*).

The seriousness of erosion and its national significance was reported by Bennett and Chapline in 1928 (*1*). As a result an educational campaign was carried on by the United States Department of Agriculture. Nation-wide interest in solution of the problem was aroused and the agricultural appropriation bill for the fiscal year 1930 appropriated $160,000 to investigate the causes of soil erosion and to develop soil and water conservation measures.

In the latter part of the calendar year 1929, installations were started on the Blackland Soil and Water Conservation Experiment

[3] Italic numbers in parentheses refer to Literature Cited, p. 109.

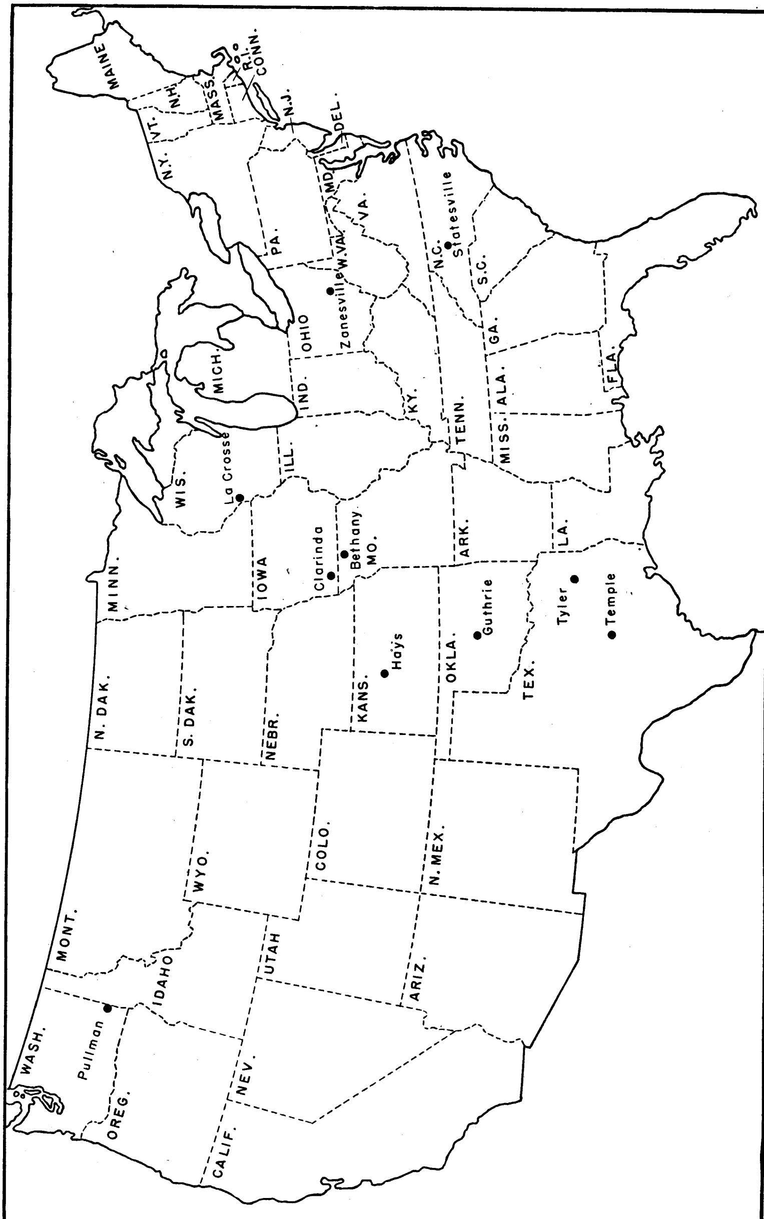

FIGURE 1.—Map of United States showing location of soil conservation experiment stations.

Station. The Texas Agricultural Experiment Station assisted in the selection of the site and in planning the work to be carried on.

In April 1935 the Soil Conservation Act was passed by which the National Government was definitely committed to the policy of soil and water conservation and provision was made for the establishment of the Soil Conservation Service in the Department of Agriculture. The stations, at this time, became an integral part of the research activities of the Service.

The research program of the Blackland station was designed to investigate the causes of erosion and to determine the most effective and practical methods of checking and controlling soil and water losses from the agricultural lands of the areas. This included experiments with various types of vegetative cover, soil treatments, cultural and cropping systems to determine their comparative effectiveness in preventing erosion, studies of the performance of terraces and check dams of different designs in removing runoff without injury to soil and crops, and attempts to reclaim and revegetate eroded land, and the keeping of meterological records.

THE PROBLEM AREA

Location and Extent

The Blackland problem area of Texas is composed of one large prairie and three smaller prairies, which originally had predominantly dark, heavy soils. The largest, the Black Prairie, comprising approximately 9,000,000 acres, extends from about 100 miles northeast of Dallas in a generally southwestward direction almost to San Antonio. The three smaller prairies, with a total area of about 2,000,000 acres, are situated east of the southern part of the Black Prairie. West of the Black Prairie lies the Grand Prairie, and here climatic and certain soil conditions are so comparable to those of the Blackland problem area that at least a part of the prairie may be considered as being served by the Blackland Soil and Water Conservation Experiment Station at Temple, Tex.; thus the total area served by the station is approximately 15,000,000 acres. The map presented (fig. 2) shows the location and soil groups of the Blackland prairies and of the Grand Prairie.

Soils

Carter (*3, pp. 55–56*) describes the soils of the problem area as follows:

> The predominating soils of the Blackland Prairie region are very dark and of heavy clay texture. On account of the dark color and waxy, sticky consistency of these soils when wet they are commonly included in the term "Blackland" or "Black waxy" land. The normal soils developed on areas that are smooth and without much slope, are made up of thick, deep soil layers which merge together and grade below into the parent-material without a sharp line of change. The soils are moderately well supplied with organic matter, and are of two general kinds as regards structure. The greater part of the area is occupied by soils that are calcareous and granular, while other soils, developed chiefly on flat surfaces are not calcareous and on drying become very tight and hard. Small areas of soils occur that while not calcareous are moderately friable.

The principal upland soils of the problem area are described in more detail in table 1. A typical profile of the deeper phases of the Blackland soils is shown in figure 3.

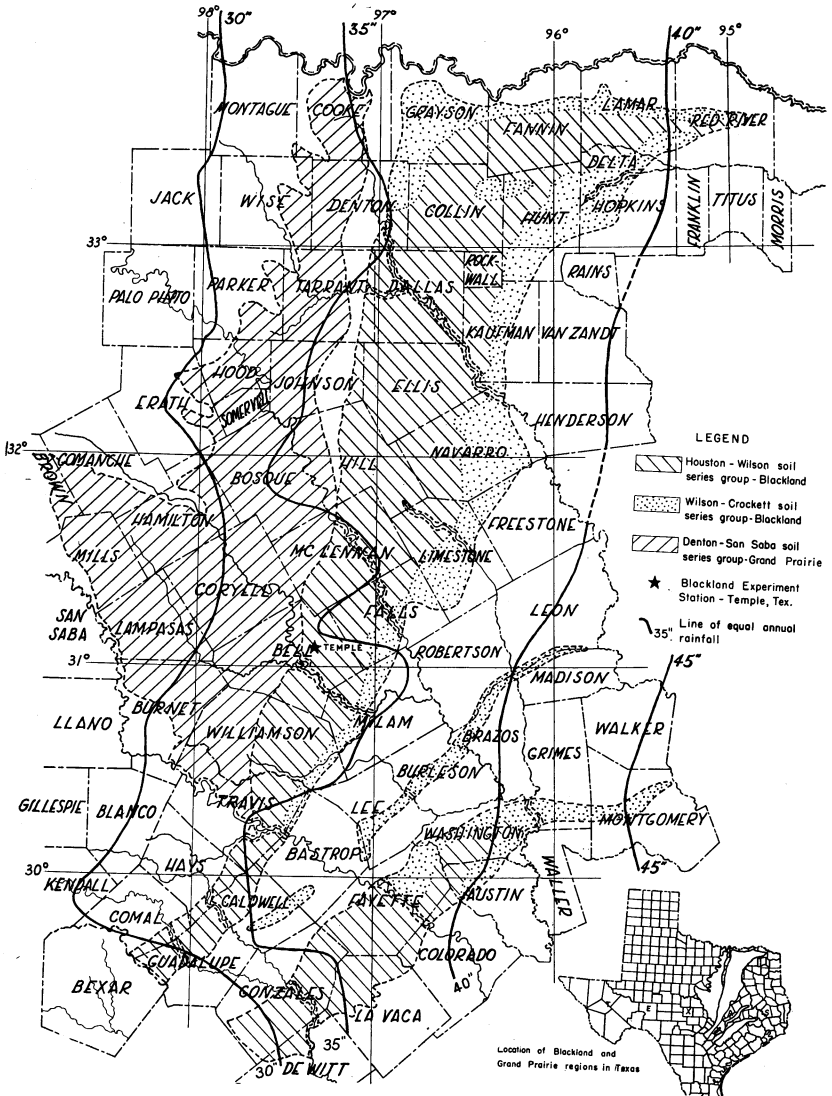

FIGURE 2.—Location of Blackland and Grand Prairie areas in Texas, showing soil series and location of the Blackland Experiment Station, near Temple, Tex.

Topography

The surface features of the Blackland prairies may be described in general as gently undulating to rolling. Flat to very gently sloping areas occur locally. Along parts of the western edge of the Blackland there is an escarpment, which in many places presents a rough, broken topography. The Trinity, Brazos, and Colorado Rivers and several smaller rivers flow in a southeasterly direction through the problem area to the Gulf. These larger streams have numerous tributaries, and this system dissects the area sufficiently to provide good drainage for almost every farm.

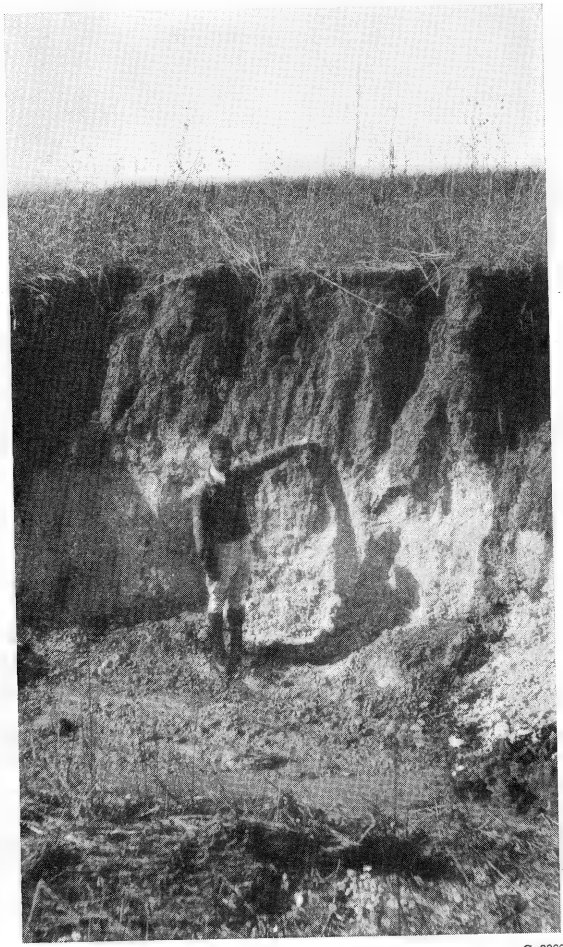

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Figure 3.—Profile of deep phase Houston black clay.

Climate

The normal annual rainfall of the Blackland area varies from 45 inches in the eastern part to 30 inches in the western part with approximately 94 percent of the area falling within the 30- to 40-inch belt. The greater part of the rainfall comes in short intense storms during the late spring and early fall, which accounts for more than three-fourths of the soil losses. Intense storms, however, may occur at any time during the year. The winter rains are generally of long duration and of considerable amount, but without intense bursts. They remove very little soil. Very little snow falls during the winter months.

Rainfall distribution over the area is erratic throughout the year. This condition and the intensities of the rains make it necessary that erosion-control measures in the whole region be designed to take care of high intensities and to dispose of runoff water in such manner as not to cause excessive erosion.

TABLE 1.—*Principal upland soils of the Blackland prairies* [1]

Soil groups (series)	Topsoil	Subsoil	Substratum (parent material)	Chief crops grown
Rolling upland prairies:				
Calcareous (granular):				
Undulating to rolling Houston.	Black, dark gray or ashy black to brown; friable.	Dark gray, brown or yellowish; highly calcareous; moderately friable, or crumbly.	Chalk or marl	Cotton, corn, small grains, sorghums, various feed crops.
Undulating to rolling Austin.	Grayish bown or brown; granular, friable.	Dark gray or grayish brown; granular.	Chalk or chalky marl	Same as above.
Rolling, steep slopes Sumter.	Brown or yellowish brown; friable	Yellow to greenish yellow; crumbly	Marl	Cotton, small grains, sorgo, and other feed crops.
Flat to undulating old stream benches (above overflow). Bell.	Black to dark brown; friable	Dark gray to brown; crumbly	Calcareous clay over beds of gravel in places.	Cotton, corn, various feed crops, small grains.
Lewisville	Brown; friable	Brown or yellow; crumbly	Calcareous clay over beds of gravel.	Cotton, corn, feed crops, small grains.
Noncalcareous (not granular):				
Flat to gently rolling Wilson.	Black to dark gray; very tight when dry.	Brown or dark gray; dense, tough	Marl or very slightly calcareous clay.	Cotton, feed crops, small grains.
Flat to undulating old stream benches (above overflow). Irving.	Dark ashy gray to black; very tight when dry.	Dark gray or brown; dense, tough	Clay or sandy clay on beds of gravel.	Cotton, feed crops, small grains.
Noncalcareous (cloddy to moderately granular):				
Rolling Ellis.	Brown, moderately friable	Greenish yellow; dense, calcareous in places.	Shale and clay, calcareous in places.	Cotton, small grains, sorgo, and other feed crops.
Gently rolling Crockett.	Black to brown or spotted; moderately friable.	Reddish or yellowish or mottled with gray.	Slightly calcareous clay	Cotton, feed crops.

[1] Table adapted from Texas Agricultural Experiment Station Bulletin 431, The Soils of Texas, p. 57.

The length of the frost-free period varies from 230 to 250 days. The winters are open with only a few days during which the ground is frozen as deep as 3 to 6 inches. The effect of freezing and thawing is not an important erosion problem, though this process tends in a minor degree to enlarge gullies that have formed vertical banks and causes some erosion on roadway cuts and fills. The summers are hot and dry, but periods of moisture deficiency may occur at any time during the year.

Erosion and Runoff History

As the name "Blackland Prairie" indicates, the original plant cover of the problem area consisted almost entirely of numerous varieties of grass. The boyhood recollections of A. B. Conner, director of the Texas Agricultural Experiment Station and a native of the Blackland


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Figure 4.—The result of poor soil management in the Blackland. Note the rows up and down the slope in the background, and the severely overgrazed condition of the pasture in the foreground.

section of Texas, furnish an excellent idea of the original cover of the grassland prairies about 50 years ago. He recalls that there was a high degree of uniformity in the grass cover of the prairies. The chief grass was little bluestem (*Andropogon scoparius*). A few large isolated mesquite trees were to be found over the prairie lands. These lands were entirely covered by vegetation, except for "buffalo wallows" and an occasional anthill.

Clumps of gamagrass (*Tripsacum dactyloides*) occurred often and were well distributed over the range. Little bluestem was found adjacent to the ant beds, and a few plants of Texas needlegrass (*Stipa leucotricha*) occurred in the open areas around the anthills. The "buffalo wallows" were saucerlike depressions from 3 to 8 feet across and were generally bare, though the natural cover of the range lands came up to the edge of these depressions.

Agricultural practices, livestock, and other factors have transformed the cover of the Blackland prairies. The few native meadows that

remain are composed principally of the following grasses, in order of their abundance or dominance; Little bluestem (*Andropogon scoparius*), Texas needlegrass (*Stipa leucotricha*), big bluestem (*Andropogon fur-*

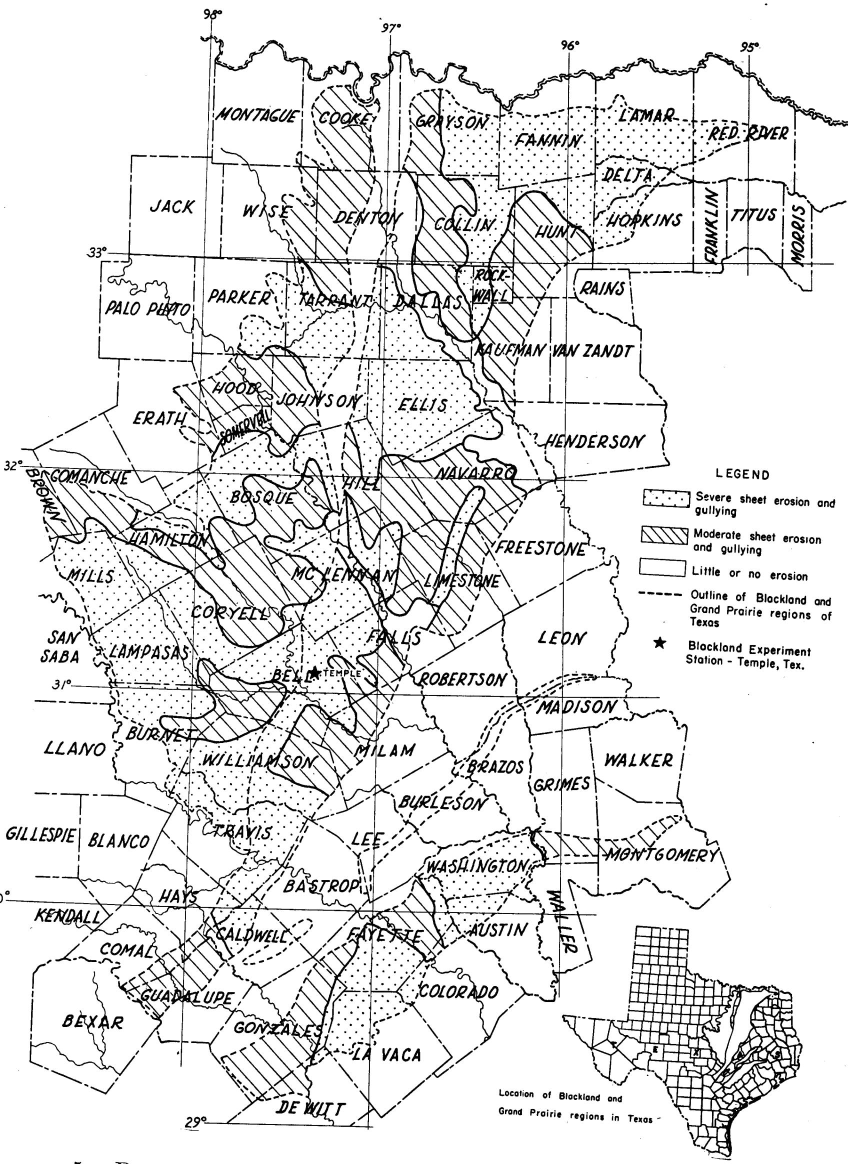


FIGURE 5.—Degree and extent of erosion in Blacklands and Grand Prairie of Texas.

catus), side-oats grama (*Bouteloua curtipendula*), and Indian grass (*Sorghastrum nutans.*)

Today, there are relatively few virgin meadows in the problem area, and they are highly prized for the quality of hay they produce. The

uncleared parts of valleys and adjoining slopes still support a growth of elm, oak, willow, cottonwood, pecan, and hackberry. Small mesquite trees occur in widely scattered places, especially in pastures. The greater part of the virgin prairies has been brought under cultivation only within the last 50 to 60 years, but the area is now one of the most important agricultural regions of the southwestern part of the United States. The fertile and favorable climate make cotton the principal cash crop, with corn, small grains, and sorghums important secondary crops. Under the present type of farming very little attention is paid to maintennce of soil fertility, either through the proper handling of crop residues or the growing of green-manure crops.

Nearly all the cultivated crops in the problem area, such as cotton and corn, are grown in rows parallel to fences or turn rows without regard to slope of the land. This practice, which has been conducive to severe sheet erosion, is often followed by gullying. Even the areas devoted to pasture have been neglected and overgrazed to such an extent that severe erosion has resulted (fig. 4). Slopes with gradients as low as 2 percent sustain heavy soil losses, and many fields have been so badly cut by gullies that they have been abandoned. Erosion has been the principal factor in reducing crop yields over widespread areas. Twenty to thirty years ago, a yield of one-half to one-third bale of cotton an acre was not uncommon, but as the result of erosion and the advent of cotton root rot 4 to 6 or even more acres are now required to produce a bale.

An erosion reconnaissance survey of Texas conducted by the Soil Conservation Service in 1934 revealed the extent and severity of erosion in the Blackland area. An erosion map of the area (fig. 5) shows the extent and degree of soil erosion.

Only 10 percent of the area had little or no erosion. Moderate sheet and gully erosion was prevalent on 39 percent of the area, and 51 percent was found to be severely damaged by sheet erosion and gullying.

The survey also indicated that of the approximately 15 million acres in 61 counties served by the Blackland station, there are 9,400,000 acres of cropland, of which 82 percent is in need of soil conservation measures. Overgrazing and erosion have seriously decreased the stock-carrying capacity of 5,600,000 acres in range. Of the Blackland prairie area proper, consisting of approximately 11 million acres, 85 percent is cultivated.

THE STATION

The Blackland Soil and Water Conservation Experiment Station is located 3 miles south of Temple, Tex., and is slightly southwest of the center of the problem area. The site was selected because the topography, soils, climate and type of farming of the vicinity are typical of those of the greater part of the Blackland problem area. Figure 2 shows that the station is well located in the area it serves in Texas.[4] The present land lines of the entire station are shown in figure 6.

The soil and water conservation work is conducted cooperatively with the Texas Agricultural Experiment Station. The headquarters of Texas substation No. 5 are used by both agencies and the two stations are known collectively as the Blackland Experiment Station. The headquarters building, control plots, and adjacent fields are shown in the aerial photograph, figure 7.

[4] Houston soils also occur in Alabama and Mississippi, where they are derived from Selma chalk.

The original federally controlled land consisted of about 140 acres of leased land upon which work was started the latter part of 1929.

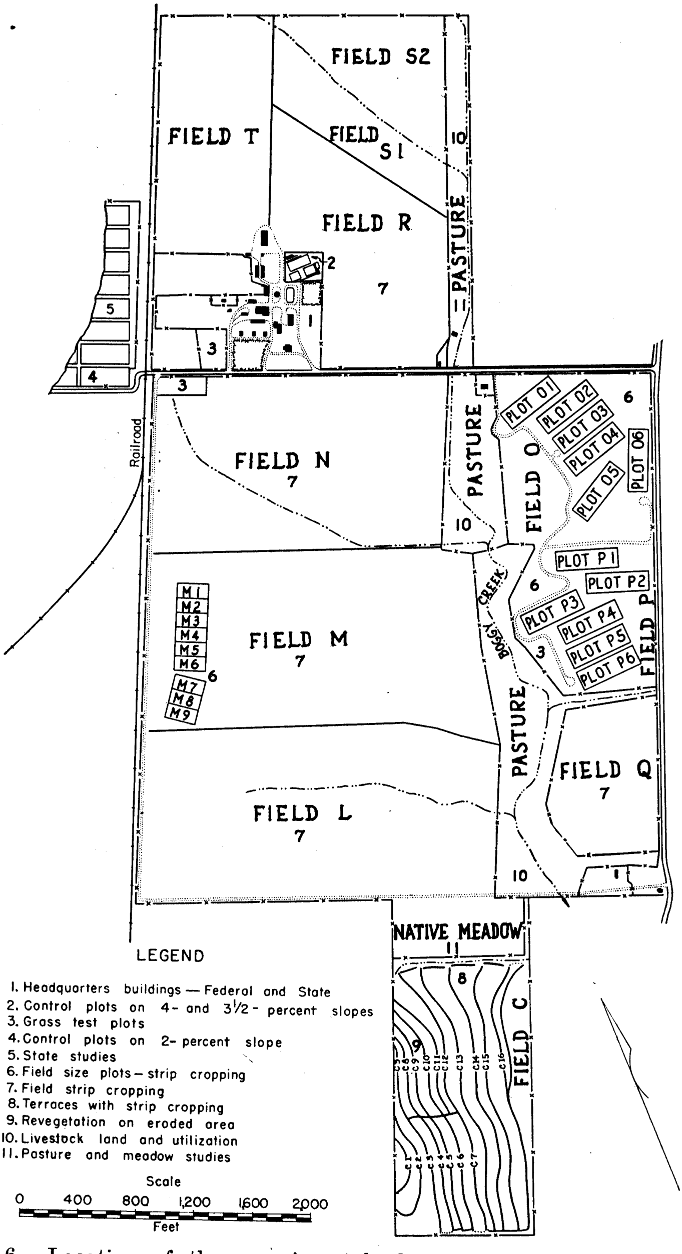


FIGURE 6.—Location of the experimental plots and fields of the Blackland Conservation Experiment Station.

Nearly all of the farm was terraced, and the first experimental data became available in 1931. Except for small areas of Bell, Trinity, and

Sumter clays, the soils of the station were mapped as Austin clay (formerly Houston clay) and Houston black clay. The maximum difference in the elevation of the land on the central farm is about 90 feet. The slope of the greater part of the originally leased land is mostly 3 to 4 percent. The Chapman farm of 33 acres, nearly a mile southwest of the central farm of the station, was leased and terraced in 1932, and experimental data were first recorded on January 1, 1933.

The Penn farm of 18 acres also was leased and most of it was strip-cropped. The first records here were taken July 30, 1933. The total area of the three farms was approximately 191 acres. Leases on the three farms were terminated in 1936, following the purchase of a tract

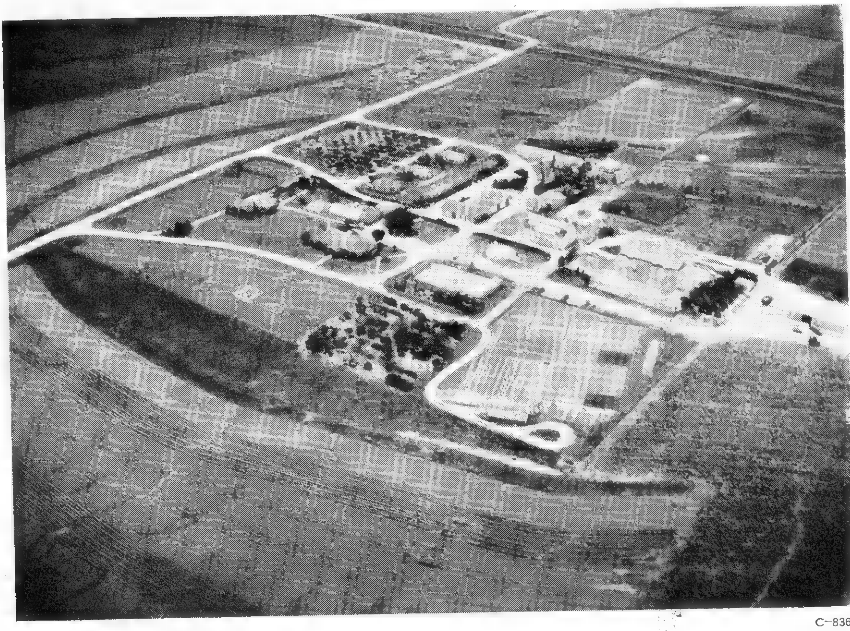


FIGURE 7.—Aerial view of the headquarters, Blackland Experiment Station, looking west.

of 450 acres of land adjoining Texas substation No. 5 by the Federal Government for further research. A soil, erosion, and topographic map of the present station area is shown in figure 8.

Up to April 1935 the work of the station was cooperative between the Bureau of Chemistry and Soils and the Bureau of Agricultural Engineering of the United States Department of Agriculture and the Texas Agricultural Experiment Station. Since that time, the station has been operated by the Soil Conservation Service in cooperation with the Texas Agricultural Experiment Station.

Approximately 450 acres of land are devoted to experiments designed to study the problems of soil erosion as they exist and to develop practical erosion-control measures that are compatible with the economic use of the land and human resources of the area.

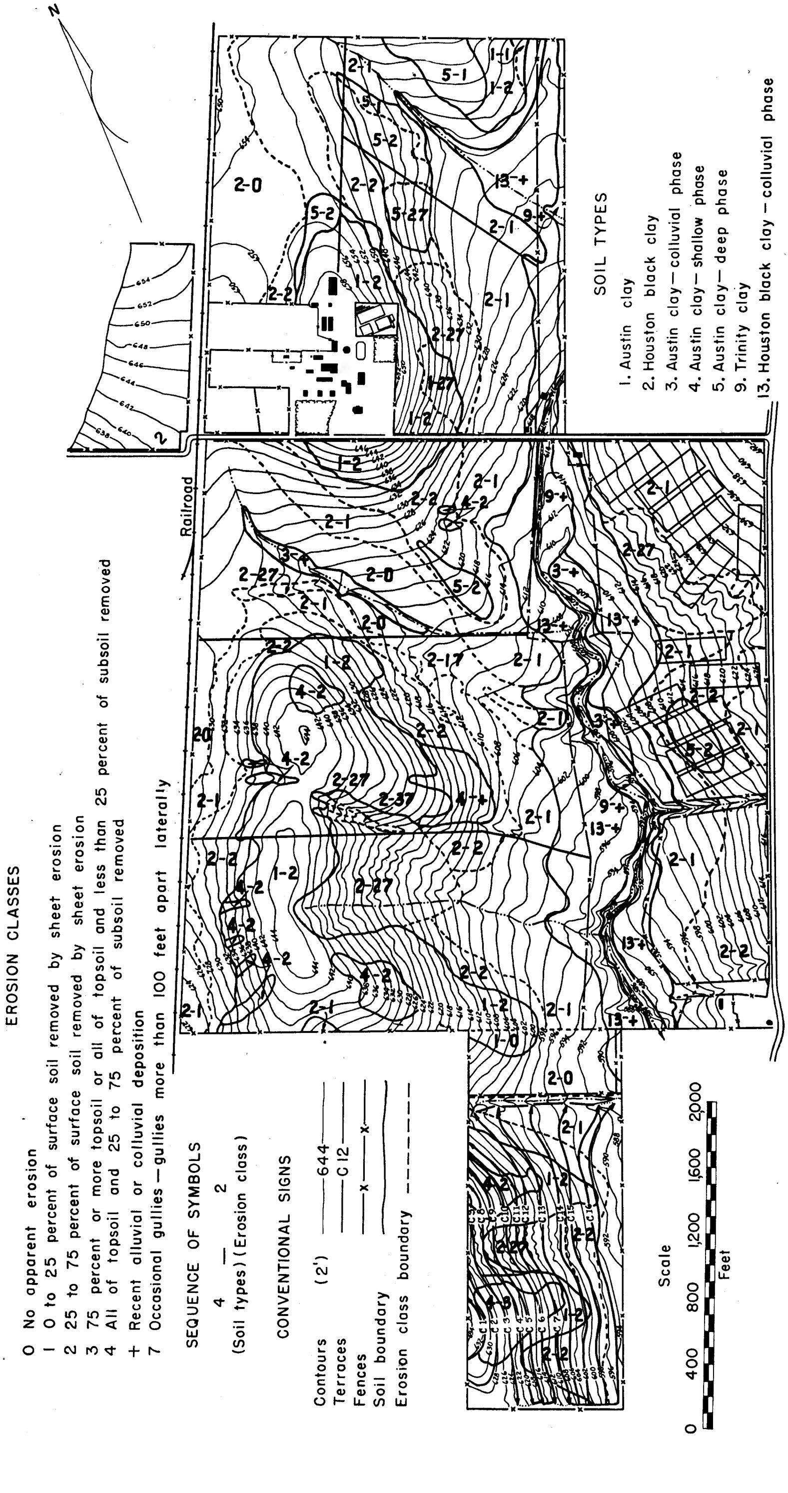


FIGURE 8.—Soil types and the degree of erosion on the Blackland Experiment Station.

METHODS OF INVESTIGATION

THE EXPERIMENTAL AREAS

Some method of measuring the effectiveness of various treatments and practices in the control of soil erosion is necessary. For this purpose, experimental areas were installed at the station and equipped with devices for measuring soil and water losses. These experimental areas vary in size from lysimeters 3 feet in diameter to terraced field areas of several acres. A more general description of the size of the areas would divide them into three groups, the control plots, the medium-sized plots, and field-scale plots. On the first two types it is necessary that all the farming operations be conducted by hand or at best with only the assistance of a garden plow. All farming operations on field-scale plots and terraced areas are conducted in accordance with normal farming practices.

Control plots.—The control plots consist of a series of 11 plots established (Nos. 1 to 11) on a 4-percent slope of Austin clay (originally classified as Houston black clay) (fig. 9). Nine of the plots are 6 by 72.6 feet, or 1/100 acre. One plot is of double length with an area of 1/50 acre, and one is of half length with an area of 1/200 acre.

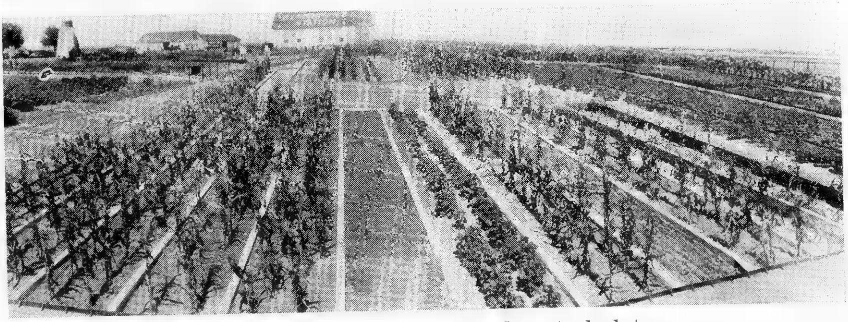


FIGURE 9.—The experimental control plots.

Moisture plots.—A series of 10 plots similar to the control plots was established for the purpose of making studies of the moisture content of the soil under the conditions represented in the control plots.

Crop-rotation plots, 2 percent slope.—This series consists of five plots (Nos. 18–22), 1/35 acre on a 2-percent slope of Houston clay soil. They are more fully described in appendix, table 17.

Strip-cropped plots.—Five medium-sized plots (Nos. 12, 13, 14, 15, and 16) were established on a 3½ percent slope of Austin clay (originally classified as Houston black clay) for a study of the effects of row direction and strip cropping (fig. 10). A sixth plot, No. 17, was established on a 2-percent slope, Houston black clay soil.

The large strip-cropped plot (No. 23) was on a 4- to 6-percent slope of Houston clay. Rotated crops of cotton and corn were alternated in four strips 75 feet in width with rows on the contour. Two plots (Nos. 24 and 25), one with rows down slope and the other with rows on the contour, were used as checks for the strip-cropped area.

There are six plots each in fields O and P. These plots are each 1.5 acre in size, on Houston clay and Austin clay soils, and are tilled on the

C-8368

FIGURE 10.—Medium-sized strip-cropping and row-direction plots on 3½ percent slope, Austin clay soil.

C-8375

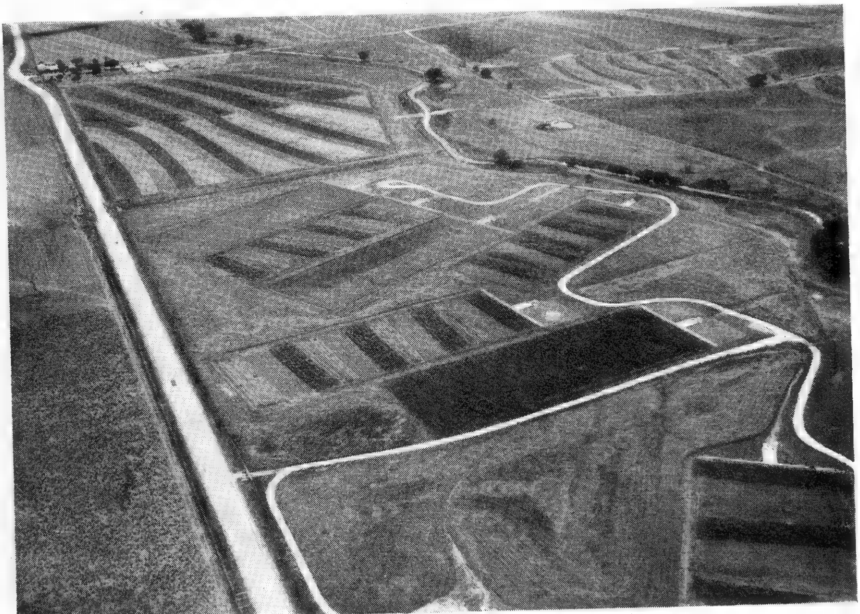
FIGURE 11.—Aerial view of field O showing cropping and location of plots. Field P plots are in the background. Plots are 1.5 acres in size.

contour according to the normal field practices with three plots on each field stripcropped and three planted solid (figs. 11 and 12).

Field watersheds.—Two fields, F and G, each of about 2 acres, one planted on the contour and one with rows down slope, were also under measurement. The cropping practice for the fields is shown in appendix, table 17.

Infiltration plots.—Plots M–1 and M–9 are one-half acre in size and are installed on a 3-percent slope of Austin clay. A more detailed description of these plots and their treatments is given under the section, Infiltration Studies.

Lysimeters.—Six lysimeters were installed at the station in 1930 and six in 1934. All were 3 feet in diameter and 3 feet deep, on Houston



C–8375

FIGURE 12.—Aerial view of field P showing cropping and location of plots. Plots are 1.5 acres in size.

black clay. They were installed without disturbing natural soil conditions.

Terraces.—Altogether there were 50 terraces at the station varying in length from about 200 to approximately 2,000 feet. Twenty of these were equipped with devices for measuring soil and water losses. Those without measuring devices were used for obtaining observational and other data. A full description of the terraces under measurement is given in table 17 in the appendix.

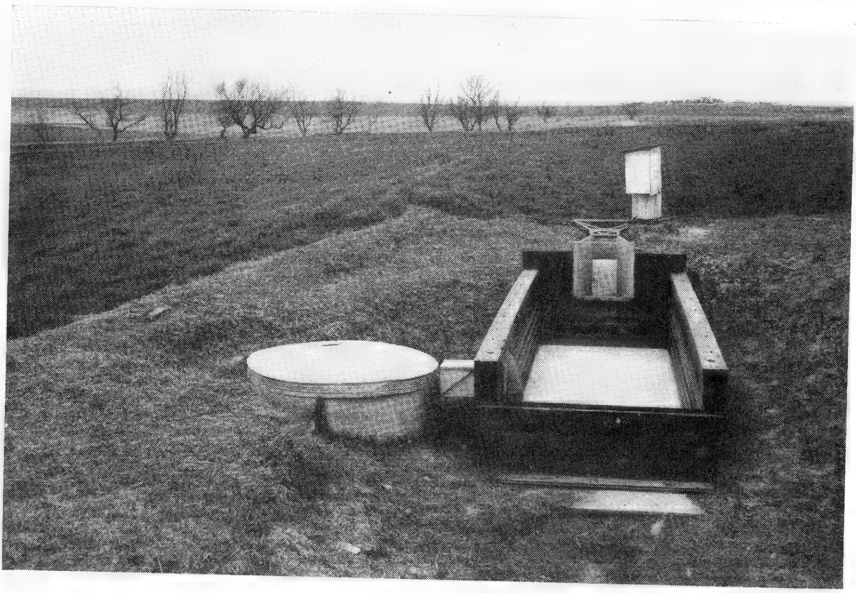
METHODS OF MEASUREMENT

The principal measurements were of the amount and intensity of rainfall, surface runoff and soil loss in runoff from the various experimental areas. Methods of making these measurements at the station during the period of the investigations reported are described in the following paragraphs. Runoff was computed in surface inches

and in percentage of rainfall for an individual storm or for the period of the investigation, and soil loss was computed in tons of dry soil per acre. Determinations of soil moisture were also made on some experimental areas.

The soil and water losses from the control plots were determined by catching all of the material in tanks at the lower end of the plots. On all of the other areas approved aliquot methods were used to measure the amount of soil loss and the runoff was determined by rated measuring devices.

Rainfall.—The amounts and intensities of rainfall were measured and recorded by means of Fergusson rain gages. Rainfall was also measured at various locations by standard Weather Bureau gages.



C-8359

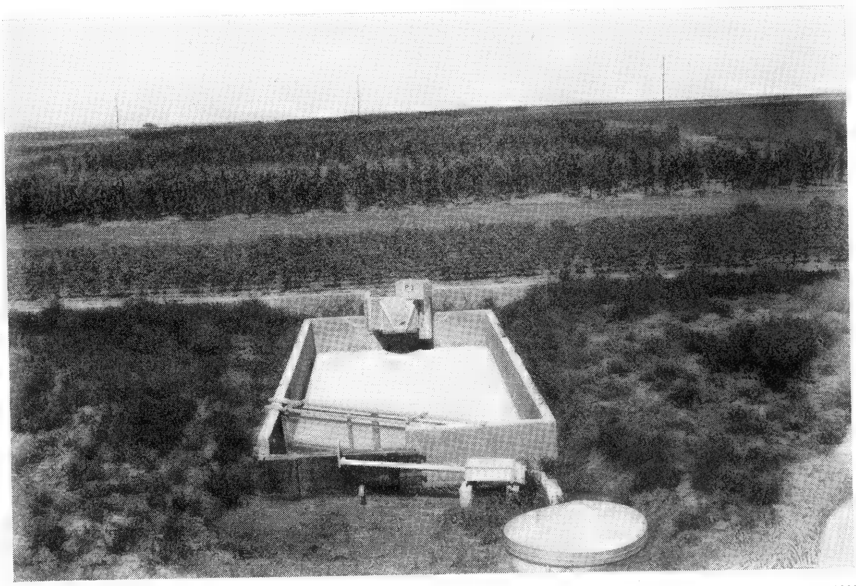
FIGURE 13.—Runoff and soil-measuring equipment at the outlet end of a terrace channel.

All other meteorological data were obtained by the use of standard Weather Bureau equipment.

Runoff and soil loss from terraces and fields.—Measurements of surface runoff and soil loss in runoff from the terraces and field watersheds were made with Parshall flumes and Ramser silt samplers (fig. 13). By this method runoff flows through a flume, where an automatic water-stage recorder records the depth of flow and the time on a chart. From this record the rates of runoff and the total runoff for a storm are determined. The runoff water with its load of eroded material discharges from the flume into a silt box, where the heavier particles settle out, and then flows into an outlet ditch over a rectangular weir at the end of the box. As it goes over the weir, a sample of the runoff water is taken out through a divisor box into a storage tank. Samples are taken of the material in the silt box and in the storage tank, and the oven-dry soil content is determined in the laboratory.

Runoff and soil loss from field O and P plots.—Type H measuring flumes, developed by the Soil Conservation Service Hydrologic Laboratory, were used for measuring the rates and amounts of runoff from the field-scale plots O–1 to O–6 and P–1 to P–6 (fig. 14). The soil loss is determined in the same manner as that used for terraces (fig. 13).

Runoff and soil loss from control plots.—Measurements of surface runoff and soil loss in runoff from control plots of 1/200, 1/100, and 1/50 acre were made volumetrically. By this method the total surface runoff from a plot is caught in a concrete tank at the lower end of the plot, which is designed to hold the greatest amount of runoff expected from the plot. Samples are taken of the sludge after the water is



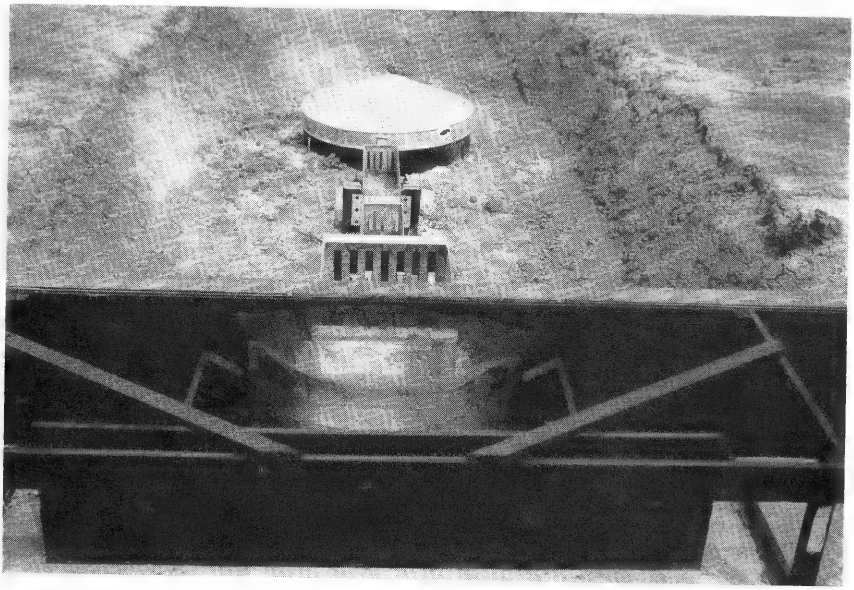
C–8360

FIGURE 14.—Type of runoff and soil-measuring installation used on fields O and P, 1.5 acre plots.

drained off and from the oven-dry soil content of these samples the quantity of soil lost from the plot is determined.

Runoff and soil loss from medium-sized plots.—Geib devisors were used for measuring losses from the plots Nos. 12 to 25. The installation consists of a silt box, where the heavier particles in the runoff settle and the trash is screened out, a series of divisor boxes and a storage tank (fig. 15). A divisor of the type used consists of an uneven number of identical slots, or rectangular weirs, through which soil-laden runoff water flows. The flow from the center slot is caught and taken through another divisor and so on until the aliquot is a convenient amount to handle. It is then run into a storage tank. For example, a series consisting of a 9- and a 5-slot divisor will deliver $\frac{1}{9}$ by $\frac{1}{5}=\frac{1}{45}$ aliquot to the storage tank. Samples are taken of the material in the silt box and in the storage tank. The total water content and the total dry-matter content of the aliquot collected in the storage tank multiplied by the reciprocal of the amount of cut

(1/45 in the above sample) gives the amount of soil and water lost through the divisor boxes. The dry-soil content of the material



C–8362

FIGURE 15.—Geib divisor installation.

in the silt box added to the amount lost through the divisor boxes, is the total amount of soil lost in runoff from the area. The water

C–8363

FIGURE 16.—Material eroded from plot 25 during one storm. This material includes large quantities of organic matter.

retained in the silt box, added to the amount lost through the divisor boxes, gives the total amount of runoff.

Percolation, runoff and soil loss from lysimeters.—The lysimeters were installed in such a way that water passing through the soil profile was collected and diverted into a lysimeter cellar, where it was caught and measured. The runoff was also diverted into the lysimeter cellar and measured.

Observations and records.—As is true with all experiments, it was not possible to measure quantitatively all factors affecting the experiments. Observations and records were made after each rain and at intervals between rains as to conditions affecting the experimental areas, such as conditions of surface and plant cover, occurrence of washes, date of planting, time and methods of cultivation, and condition of crops.

PURPOSE AND PLAN OF EXPERIMENTS

The measurements of soil and water losses from the plots and fields are taken for two purposes: (1) To determine the rate and causal factors of erosion under local farm practices and normal plant covers; (2), to determine the efficacy or relative effects of farming practices and soil and water conservation measures which are developed.

CONTROL-PLOT STUDIES

The 11 control plots were the first installations on the station. They were set up to study the causal agencies of erosion. Soil and water losses are obtained under continuous Bermuda sod, continuous corn, rows down slope, and other cropping practices that represent improvements over single crop-row farming. These plots are on 4-percent slope Austin clay (originally correlated as Houston black clay). The results from these plots are not directly applicable to field areas, but serve as indicators for the development of field-scale soil and water conservation practices.

CROP-ROTATION STUDIES

Crop rotations on plots were studied for the purpose of determining the effect of various plant covers on soil and water losses and to compare the effect of cropping practices common to the region with the effect of improved cropping practices on soil and water losses.

The cropping practices included in this study were continuous corn, rows down slope; a corn-oats-cotton rotation, rows down slope; a corn-oats-cotton rotation, rows across slope; and continuous Bermuda grass sod.

SLOPE STUDIES

The effect of length and steepness of slope on soil and water losses was studied by means of control plots installed on slopes of various length and terraces of different vertical spacings. Although the plots are not identical, some information can be obtained, as to the effect of the degree of slope, by the comparison of soil and water losses from similar plots on 2-percent slope, Houston black clay, and 4-percent slope, Austin clay.

Strip-Cropping Studies

The limitations of contour strip cropping as a soil and water conserving practice were not generally known. The purpose of this experiment was to study the effectiveness and design of strip cropping as compared to a local farm practice—that of running rows parallel to field boundaries and a recognized good farming practice—that of a 3-year crop rotation of cotton, oats, corn. Small plots are used to indicate the possibilities of strip cropping as a soil conservation measure and larger plots of field size are used to determine the field application and limitation of this practice. Studies to determine the width of strips, the ratio of erodible to resistant strip widths, various crops and the limitation of the control measure with respect to length and degree of slope are conducted on the field areas of the station farm. The observations from these field areas supplement the information obtained from the measurement of soil and water losses.

Terrace Studies

A large number of terracing experiments have been completed. These experiments were designed to determine the most advantageous combinations of terrace design features, such as vertical interval between terraces, the grade of the terrace channels and length of terraces. The terraces of this study were ridge-type with broad bases to facilitate the operation of multiple-row machinery.

Contour Tillage

Several plots and one terraced field area have been used to determine the effect of contour cultivation both with and without terraces.

The Blackland soils are highly colloidal and seal very quickly after rains start. This gives large amounts of runoff, even though the soil a few inches under the surface is very dry. In an effort to study the possibilities of increasing the amount of water that might be retained on the surface and allowed to sink in slowly, a series of plots were prepared in which the practice of flat breaking and flat planting are compared with the ordinary practice of contour listing and planting and the special practice of contour listing with a furrow-damming attachment.

Maintenance of Outlet Ditches

Where runoff is to be expected from land protected by terraces, terrace outlets must always be provided. There are two types of terrace outlets—vegetative and mechanical. Each type has its advantages and disadvantages. The vegetative type usually is the cheapest to construct and most widely adapted, but mechanical structures are necessary in some critical locations.

The natural, broad, shallow, and well-sodded waterway fenced in for hay or pasture purposes is the best answer to the practical water-disposal problem.

RESULTS OF INVESTIGATIONS

Climatic Data

Soil and water losses are a direct result of rainfall and vary as the soil is affected by cover, tilth, cracked-open condition, antecedent rainfall, and the characteristics of the rainstorm itself. Ninety-four percent of the Blackland prairies lie between the 30- and 40-inch rainfall belts. The Blackland Soil and Water Conservation Experiment Station is located near the center of the Blackland area and the rainfall of 35.11 inches per year average is near the mean of the rainfall for the region. The 33.05 inch average annual rainfall for the 11-year period is also close to the mean for the region for the same period. For the 29-year period, the maximum was 50.59 inches per year and the minimum was 20.75 inches and for the 11-year period of record, 1931–41, the maximum was 46.58 inches and the minimum was 23.93 inches (appendix table 7).

The climate as here described from the 29-year record of the Texas Agricultural Experiment Station, Substation No. 5, is typical of that of the problem area. The average annual temperature is 67° F. with a maximum of 110° occurring twice. The lowest recorded temperature was 5° below 0°, but the low temperatures during the year were commonly 6° to 15° above 0°. The average annual evaporation from a free-water surface established from a 27-year record is 58.65 inches; the greatest monthly evaporation, 8.03 inches, occurred in July. The average monthly wind movement is 4,211 miles. March is the windiest with an average of 5,906 miles and September the calmest, with 3,178 miles. In general, the climate is moderate, the winters are open, the summers are hot, but cooling breezes usually prevail at night. Appendix tables 8, 9, and 10 give more complete temperature, evaporation and wind-movement data.

In order to study some of the climatic factors affecting runoff and soil loss, plot 3, of the control plots, planted to continuous corn, was taken as a criterion plot. A study of the data indicates that there is no direct correlation between soil loss and runoff, or soil loss and rainfall intensities. It is apparent that for the Blackland soils anticedent moisture and the soil conditions at the time of the rain may be such as to nullify or accentuate the effects of rainfall characteristics, such as amount and intensity. Of 1,055 rains (table 11), during the 11-year period of record, only 141 caused runoff. The total soil loss for plot 3 was 226 tons per acre. Three rainstorms caused 27 percent of this loss and the 14 storms causing highest soil loss washed off 52 percent of the total. It is often the case that one storm during the year will cause more than half of the total soil loss for the year. Figure 17 shows the average rainfall, runoff, and soil loss for plot 3 by months during the period 1931–1941 inclusive.

In general, it can be stated that one or two rains cause the major part of the soil loss each year and that these major storms are most likely to occur in April or May, but may occur almost any month during the year. This is evidenced by the fact that of the 14 storms causing highest soil losses, 3 occurred in April, 5 in May, 1 each in June, July, August, September, November and January. Conditions that contribute to an increase in the amount of soil loss are

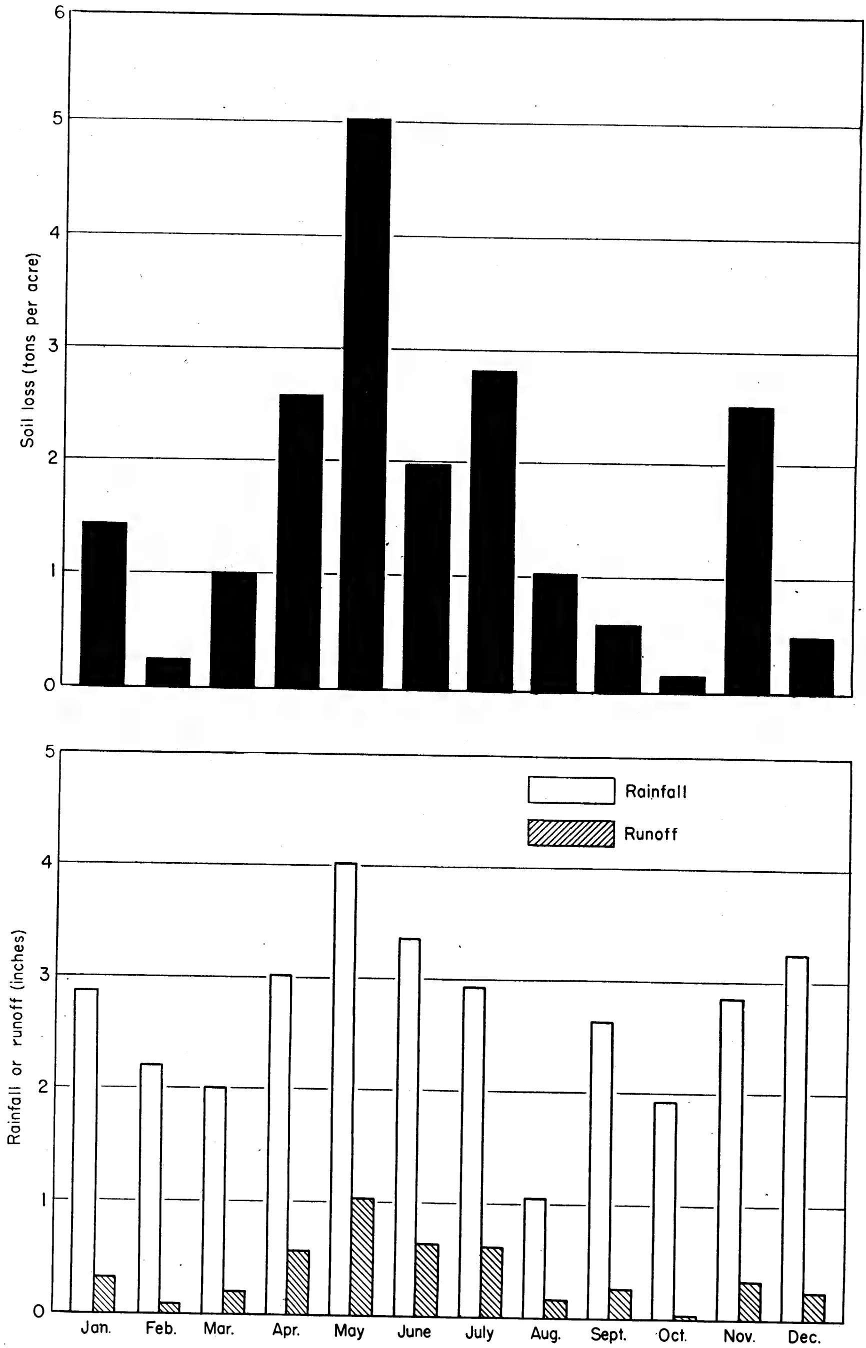


FIGURE 17.—Average monthly rainfall, runoff, and soil losses, continuous corn, control plot 3, for the 11-year period, 1931–41.

moisture in the soil from rains immediately before the storm considered, high intensity of the storm, length and duration of high intensities, absence of plant cover, more or less flat condition of the soil, absence of dry-weather cracks, and the pulverized condition of the soil. The severity of soil loss for any particular storm depends upon the extent to which these conditions are present.

The marked effect of a wet sealed-over condition of the Austin clay soil is evident in a comparison of the hydrographs for plot 3. The markedly different effects produced by two rains of similar amounts and intensities falling on Austin clay is shown by the two hydrographs of figure 18. From a study of the upper hydrograph it will be seen that a rain of high initial intensity falling on a moist slightly compact soil caused a high runoff for a brief period of about 15 minutes with an accompanying soil loss at the rate of three quarters of a ton per acre. A rainfall of slightly less total as shown on the lower hydrograph, but falling on a wet tightly packed surface soil, produced a high runoff, which did not reach its peak until near the end of a 50-minute period, and was responsible for a soil loss of almost 3.5 tons per acre. Because of the peculiar physical characteristics, particularly its high coefficient of contraction and expansion, the behavior of the Austin clay may vary markedly from time to time, depending upon the conditions produced by antecedent rains.

The strikingly different effects upon the soil and moisture losses, resulting from rainfalls of like amounts, but with different intensity distribution, is shown by the hydrographs of figure 19. Both the rain of May 21, 1942, and the one of May 23, 1938, fell on moist loose or slightly packed soil, but from the upper hydrograph it will be seen that no runoff occurred for almost an hour after the beginning of the rain and that the water loss amounted to less than 10 percent of the total rainfall and caused a loss of only 0.2 ton of soil per acre from the loose surface. In case of the high intensity depicted in the lower hydrograph, the runoff reached a high peak within 15 minutes with a loss of 43 percent of the total rainfall and a soil loss approaching a rate of 5 tons per acre. These two rains fell at about the same time of the year and on land similarly cropped to corn, hence it is reasonable to conclude that the rainfall intensities during the first quarter and the distribution throughout the period must have played an important part in modifying the runoff and soil losses resulting from the two storms under consideration.

When in a loose condition, the Austin clay absorbs moisture rapidly, but when compacted it has a tendency to run together and seal over, thus very materially reducing the infiltration rate and the resistance to overland flow. A moderate rainfall of high initial intensity falling on a dry loose soil that has been subjected to flat cultivation may cause a much higher runoff and a greater soil loss than a similar rainstorm falling on the same soil that has been spaded or plowed and left in a cloddy moist condition. The hydrographs of figure 20 record the effect of these cultural manipulations. Of a rain totaling a little more than 1 inch that occurred on March 25, 1939, and fell on dry loose flat-cultivated land, one-fifth was lost as runoff and carried with it a soil loss at the rate of over 2 tons per acre.

From a much larger total rainfall and one of greater intensity, that fell October 23, 1941, on recently spaded cloddy land, the loss of water was less than 0.4 percent and the loss of soil was negligible. These

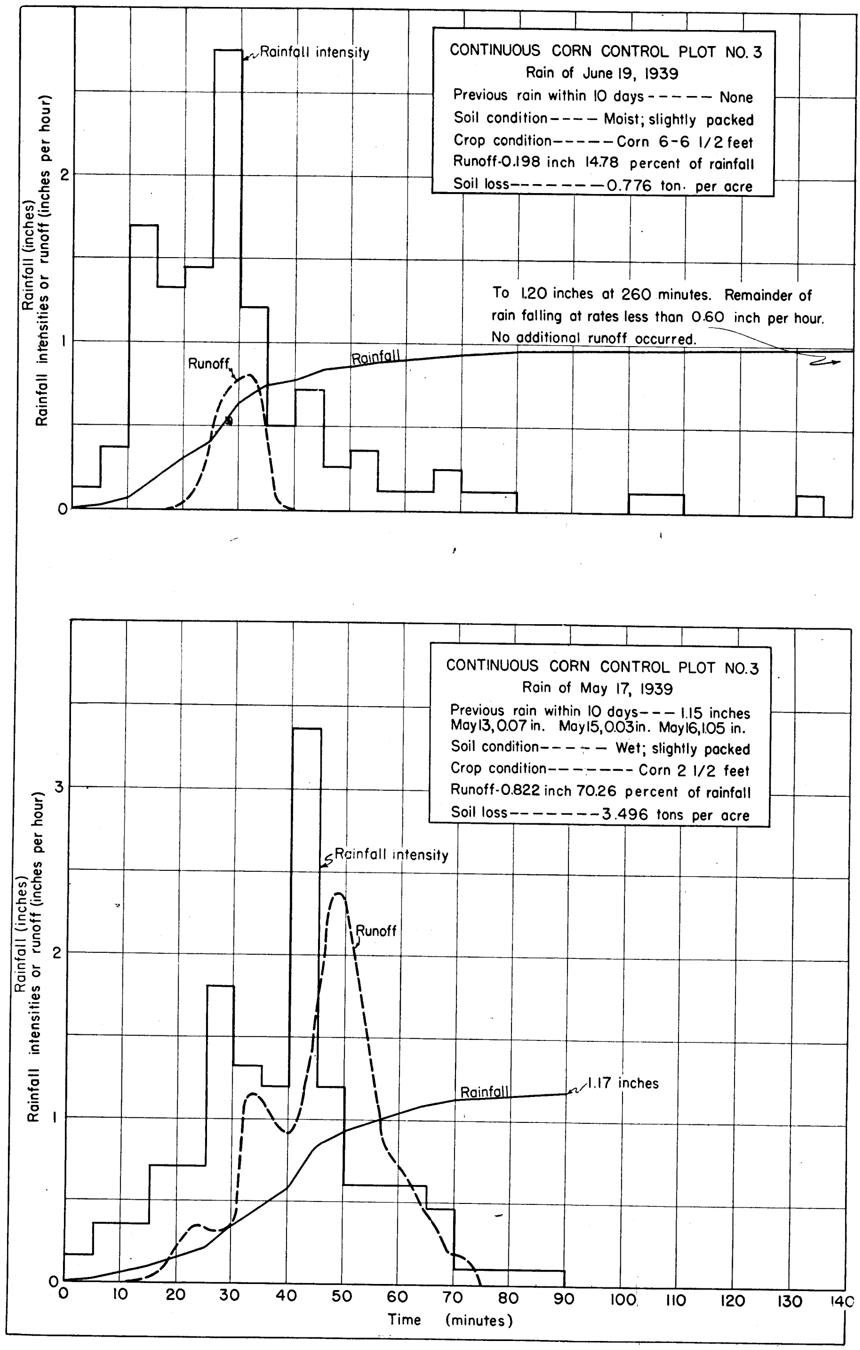


FIGURE 18.—Hydrographs of a rain that fell on wet Austin clay soil and a similar rain on a moderately dry soil.

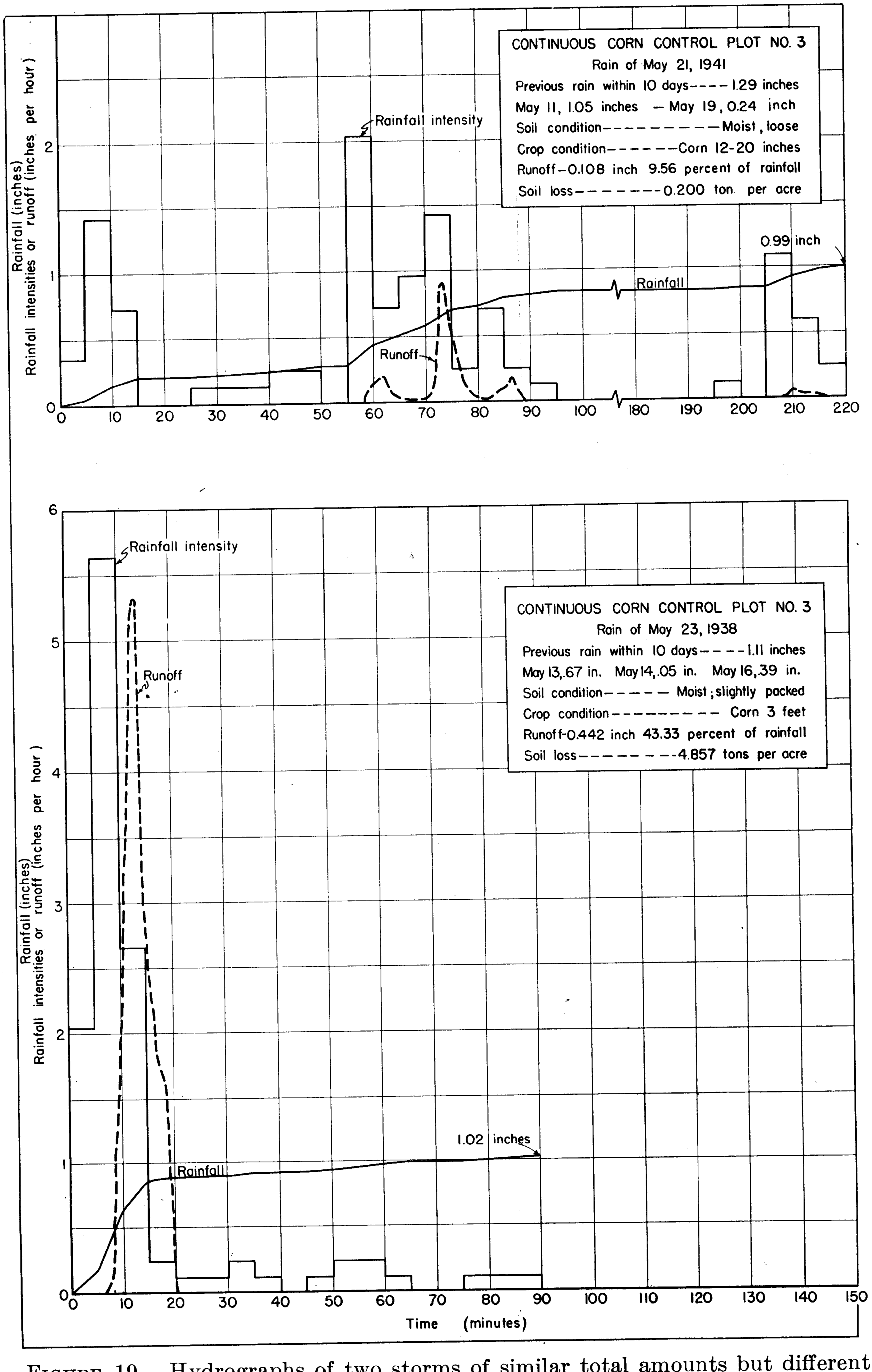


FIGURE 19.—Hydrographs of two storms of similar total amounts but different intensities falling on wet soil.

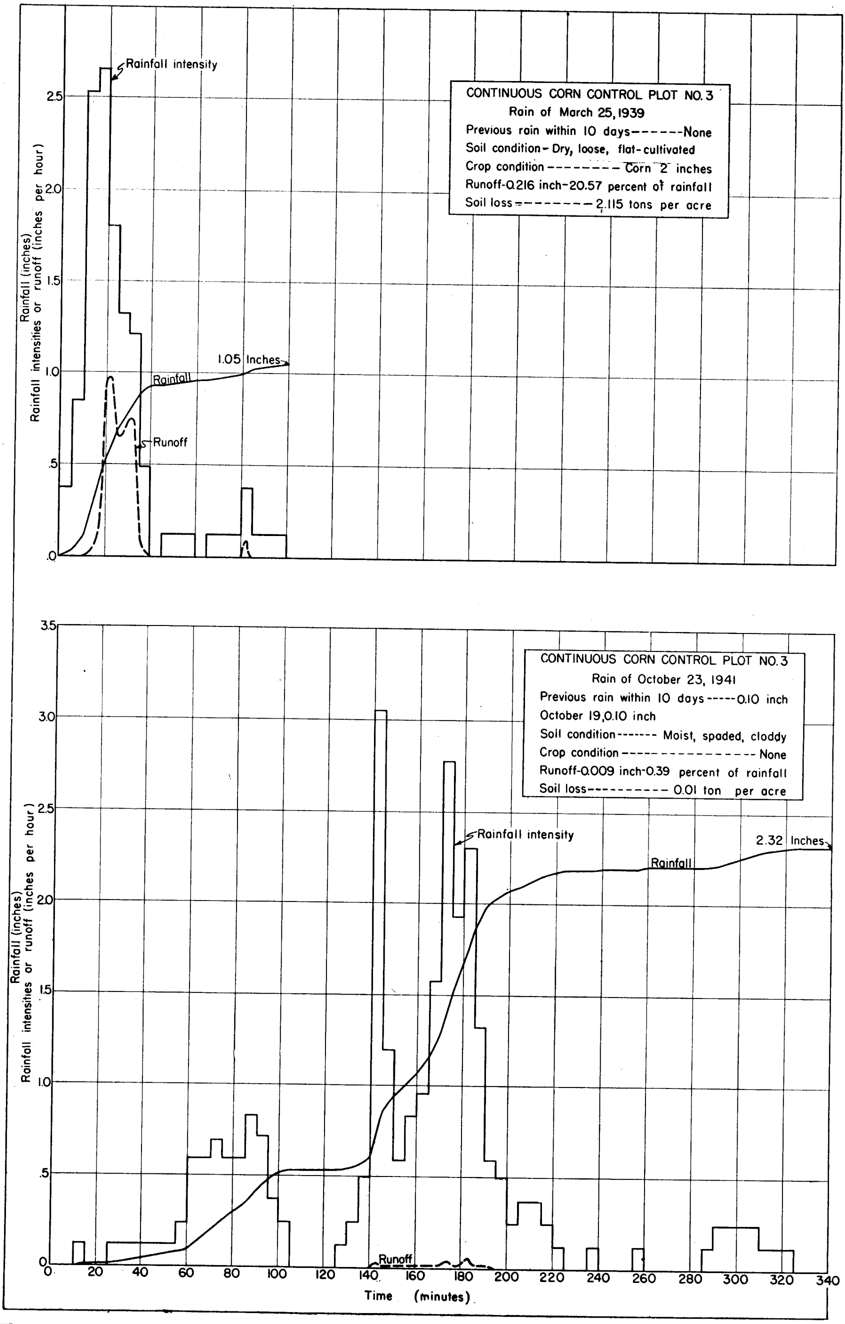


FIGURE 20.—Hydrographs showing the runoff resulting from two similar storms falling on Austin clay soil with different conditions of tilth.

records, together with other experimental data, furnish ample evidence that modifications of cultural practices can be made to play an important and significant part in the management of the soils of the Texas Blackland area.

Control Plots

The control-plot set-up was the pioneer effort of the station for measuring the extent of soil erosion and determining the causal factors. The plots are small in size and results obtained have been successfully used as indicators for the design of effective soil and water conservation measures. The results, themselves, are not directly applicable to field conditions, but the trend of the results is of great value in studying the causal factors of erosion and in the design of remedial measures. A graphic presentation of the soil and water losses from the treatments on the control plots is presented in figure 21. Appendix, table 17 gives the annual cropping treatment of the plots for the period of record, and the yearly runoff and soil losses that have occurred from the plots.

Plant cover is one of the most important factors in the control of soil erosion. A well-established plant cover, such as Bermuda grass, was the most effective means of reducing runoff and controlling erosion. The lack of effective cover is generally accompanied by severe soil and water losses. Fall oats is the most effective cultivated plant cover used at the Blackland station. The effectiveness of oats is due in part to its close-growing characteristics when drilled and to the fact that it is at its maximum-growth period during the spring months when protection is needed most.

Figure 22 shows the comparative effectiveness of Bermuda grass, corn, oats, and cotton in reducing soil and water losses.

Crop rotations in which small grain is used are effective means of reducing soil and water losses. This conservation of soil and water is due to the cover afforded by the small grain and its stubble when it actually occupies the land, rather than the after effects of the rotation or any of the crops of the rotation. This is shown by a comparison of the soil and water losses from the continuous corn with that from the corn in rotation. The continuous corn lost 20.6 tons of soil per acre per year and the corn in rotation lost 19.6 tons. The water lost as runoff was 13.6 percent and 14.5 percent, respectively, of the rainfall.

Control plots 1, 2, and 3 were set up to afford a study of length of slope as it affects runoff and erosion. The data for the period of record 1931–41 indicate a slight increase in soil loss with decrease in length of slope, and a similar effect on runoff. These results are contrary to the findings at other stations [5] (*9*) where it was found that

[5] Bartel, F. O., and Slater, C. S. Progress report of the Central Piedmont Soil and Water Conservation Experiment Station, Statesville, N. C., 1930–35. U. S. Soil Conserv. Serv. ESR-6, 134 pp., illus. [1938]. [Processed.]
Hays, O. E., and Palmer, V. J. Progress report, 1932–35, Upper Mississippi Valley Soil and Water Conservation Experiment Station, La Crosse, Wis. U. S. Soil Conserv. Serv. ESR-1, 57 pp. 1937. [Processed.]
Hill, H. O., Elwell, H. M., and Slosser, J. W. Progress report, 1930–35, Red Plains Soil Conservation Experiment Station, Guthrie, Okla. U. S. Soil Conserv. Serv. ESR-3, 41 pp., illus. 1937. [Proceessed.]
——— Mech, S. J., and Pope, J. B. Progress report, 1931–36, Arkansas-Louisiana-East Texas Sandy Lands Soil and Water Conservation Experiment Station, Tyler, Tex. U. S. Soil Conserv. Serv. ESR-4, 35 pp., illus. 1938. [Processed.]
McGrew, P. C., and Horner, G. M. Progress report, 1931–35, Pacific Northwest Soil Conservation Experiment Station, Pullman, Wash. U. S. Soil Conserv. Serv. ESR-2, 123 pp., illus. 1937. [Processed.]
Woodruff, C. M., and Smith, D. D. Progress report of the problem area of Shelby loam and related soils, soil and water conservation experiment station, Bethany, Mo., 1930–35. U. S. Soil Conserv. Serv. ESR-5, 180 pp., illus. 1938. [Processed.]

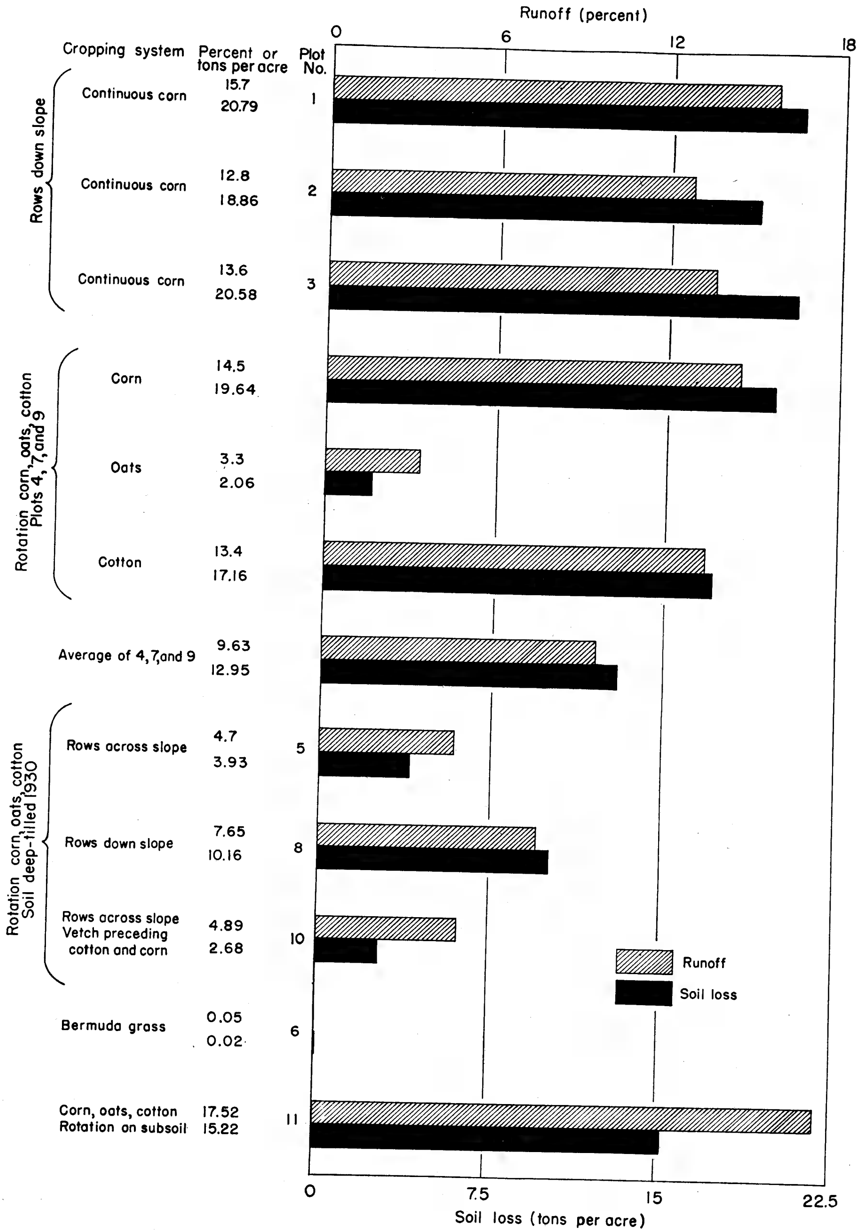


FIGURE 21.—Soil loss and runoff from control plots under different cropping systems. Averages for the 11-year period 1931–41. Average annual precipitation, 32.74 inches. Averages of runoff from plots 4, 7, and 9 are weighted percentages.

soil loss increases with increased length of slope, although the water lost as runoff did not increase in the same proportion. They are also contrary to a length-of-slope study, or terrace-spacing study, conducted at this station on six terraces C–5, C–6, C–7, A–15, A–16, and A–17. Table 6 shows the soil and water losses from these terraces for the period of record. Over a period of 11 years terraces C–5, C–6, and C–7 showed fairly consistent increases in soil loss with increases in length

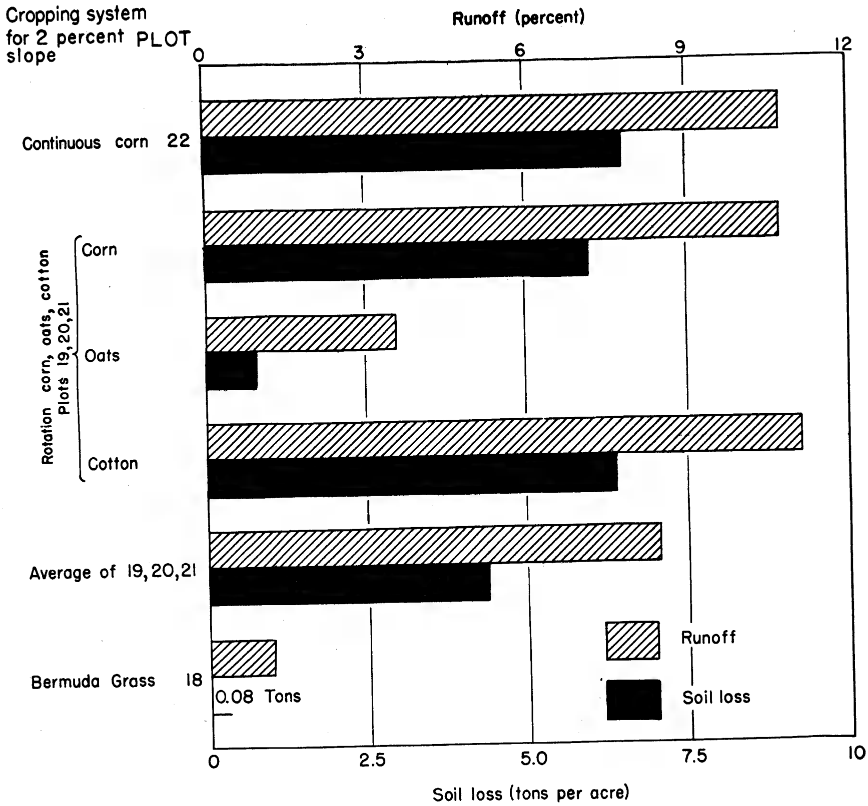


FIGURE 22.—Average annual soil and water losses, 9-year period 1933–41, from 2-percent slope of Houston black clay. Average annual precipitation, 33.77 inches. (Plot size 9 by 138.35 feet or 1/35 acre.)

of slope between the terraces. The data for terraces A–15, A–16, and A–17 were extremely erratic, but it is believed that this was due at least partly to the peculiar physical characteristics of the soil of the respective watersheds. Detailed studies of runoff from slopes of various lengths are still in progress in an effort to explain these contradictory data.

Plots 19, 20, and 21 are in a 3-year rotation of cotton, corn, oats, on a 2-percent slope of Houston black clay, and plot 22 is in continuous corn on the same slope. Although these plots are not identical as to size, or soil, with those of the control plots, some information can be obtained by comparing the results from these plots with those

similarly cropped in the control-plot set-up, which is on a 4-percent slope of Austin clay. This comparison is shown in figure 22 and indicates that an increase in the steepness of slope will materially increase the soil and water losses. This comparison is verified by the result from plots on field O with a 2-percent slope and on field P with a 3-percent slope (figs. 26 and 27).

It is a common belief among the local farmers who plow their rows straight and parallel to the fence rows that they have no soil erosion on their fields but that their soil is turning light in spots and that these light spots are not as productive as the surrounding black soil. They do not recognize the sheet erosion which is removing their black surface soil and exposing the white subsoil underneath. Information from the desurfaced plot shows that the subsoil is only about one-third as productive as the surface soil and that in dry years the crops on

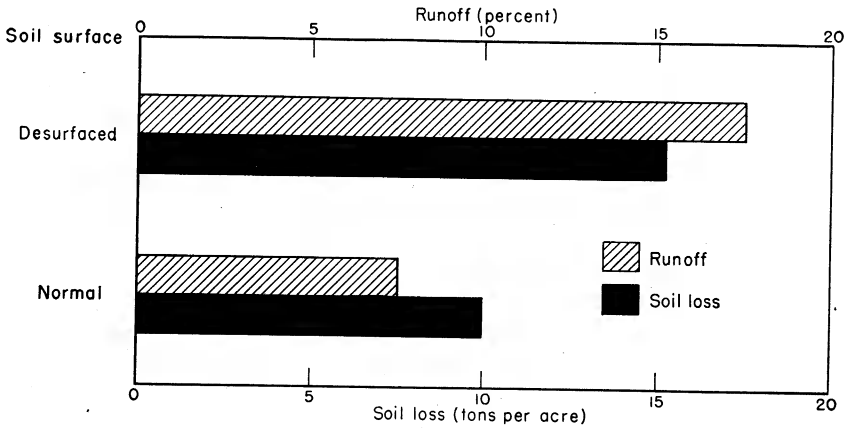


FIGURE 23.—Average annual soil and water losses 11-year period 1931–41 from control plots, 4 percent slope, Austin clay, normal and 15-inch desurfaced plots, with a 3-year rotation of cotton, corn, oats. Average annual precipitation, 32.74 inches.

the desurfaced plot may fail completely. This failure is due, in part, to the lower water-holding capacity of the subsoil. Runoff from the desurfaced plot is 2½ times that from the surface soil and soil loss is about 1½ times as much (fig. 23).

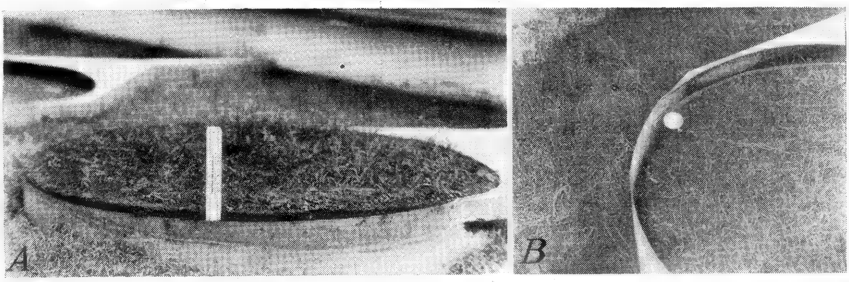
The severe sheet erosion that is occasioned by rows down slope is shown by all the plots so cultivated and especially by plot 24.

SOIL MOISTURE

During the period of record 1931–41, soil-moisture conditions were studied on the moisture plots cropped in the same manner as the control plots. This study has served to bring out the fact that the soil of the desurfaced plot 11 has a lower moisture-holding capacity than the normal surface soil of the companion plots. The variation between samples and within treatments, however, is such that no valid comparisons can be made of the effect of the different treatments on the moisture content of the soil.

Lysimeters

Two series of 6 lysimeters each were installed at this station. Measurements were made of the runoff and the water passing through the soil profiles. An effort was made to determine the division of rainfall in terms of runoff, percolation, evaporation, and transpiration. Within the set-up of 12 lysimeters there are 3 duplicates and 2 triplicates. The duplicates and triplicates vary widely in their results. This variation is probably due to the peculiar characteristics of the Houston black clay soil on which the lysimeters were located. The soil level in the lysimeters was originally about 3 inches below the top of the lysimeter can. Figure 24 shows the soil swelled up approximately 1 inch above the top of the lysimeter can. This swelling of 4 inches in profile of 3 feet occurred as the result of a long wet period during which most of the rainfall soaked into the soil. This swelled condition, of course, prevents a measurement of any runoff from this lysimeter. In the right of figure 24 is the same lysimeter except that



C–8355; C–8356

Figure 24.—*A*, Lysimeter showing the expanded condition of Houston black clay soil after a prolonged wet period. *B*, The same lysimeter showing the shrunken condition after a prolonged dry period. Original soil level was 3 inches below the rim.

the photograph was taken during the summer when the soil was dry and the soil contraction had formed large cracks, especially along the contact line between the soil and the lysimeter can. In this latter condition, all runoff from the surface of the soil flows into the cracks and is reflected as percolation. Under such variable conditions, only highly variable results can be expected, therefore, it is concluded that the results from lysimeters with Houston black clay soil cannot be compared with data from similar experiments on other soil types.

Effects of Various Tillage and Cultural Practices on Runoff and Erosion

ROW DIRECTION

The practice of farming with crop rows up and down the slope is common in the Blackland problem area. The data obtained from plots under measurement at the station clearly indicate that this method is conducive to severe erosion.

TABLE 2.—*Average annual soil and water losses from row-direction plots for the periods of record*

Plot [1]	Treatment	Land		Average annual rainfall	Runoff	Runoff in percentage of rainfall	Soil loss per acre
		Area	Slope				
		Acres	*Percent*	*Inches*	*Inches*	*Percent*	*Tons*
F	Rows up and down slope: Cotton, corn, cotton, oats; Sudan following when moisture permitted.	2.15	3.2	31.72	3.73	11.77	3.9
G	Rows across slope: Cotton, corn, cotton, oats; Sudan following when moisture permitted.	2.15	2.5	31.73	4.35	13.72	3.9
13	Rows on contour: Continuous cotton	.0847	3.5	33.70	1.57	4.65	5.9
14	Rows down slope: Continuous cotton	.0309	3.5	33.70	4.59	13.6	15.7
5	Rows on contour: Subsoiled 1930 only; corn, oats, cotton.	.01	4	32.74	1.53	4.7	3.9
8	Rows down slope: Subsoiled 1930 only; corn, oats, cotton.	.01	4	32.74	2.51	7.65	10.2
25	Rows on contour: Continuous cotton	1.39	4–6	----------	--------	----------	50.1
24	Rows down slope: Continuous cotton	.137	4–6	----------	--------	----------	53.3

[1] Periods of record: F–G: 6.9 years (from Jan. 1, 1933, to Nov. 1, 1939). 5–8: 11 years (from Jan. 1, 1931, to Dec. 31, 1941). 13–14: 9.67 years (from Apr. 28, 1932, to Dec. 31, 1941). 25–24: 5.5 years (from July 30, 1933, to Dec. 31, 1938).

Table 2 shows the effect of rows on contour as compared with rows up and down the slope. From these data it will be noted that as the degree of slope increases there is a substantial increase in the soil loss from contour cultivation alone. On the area with 4- to 6-percent slope contour cultivation alone allowed gullies to form and then concentrated the water into the gullies in such volume that the soil loss from the contoured, and now gullied, plot approached the magnitude of that from the plot with rows down slope. A small depression on the contoured plot (plot 25) in 1933 had developed into a gully about 18 inches deep in less than 3 years.

Contour farming without strip cropping or terraces increases the danger of concentration of water and the consequent formation of severe washes that eventually become gullies.

The data from fields F and G, table 2, indicate that the contoured plot lost the same amount of soil and slightly more water than rows up and downslope.

Indications are that contour cultivation applied to field areas, that is, rows on the general contour, is not as effective in conserving soil and water as would be indicated by the results from small plots. Even on the small plots the saving of moisture by contour cultivation is normally not reflected by increases in crop yields except for cotton. This is probably due to the fact that in this area, except for cotton with its longer summer-growing season, the spring rainfall is normally well distributed for crop production and few crop failures result from lack of moisture. The foregoing data point to the conclusion that contour cultivation without the support of strip cropping or terracing should not be relied on to reduce soil and water losses from intense storms. Only storms of short duration and low intensity can be effectively controlled by contour cultivation alone, even on the gentler slopes of this area.

TIME OF OPERATION

The predominant soils of this area tend to dry and crust after heavy rains. When they do this it is good practice to cultivate the

crops, not only to keep down grass and weeds, but also bring the soil into a granular or rough condition and thus make it receptive to the next rain. This practice is commonly followed by the better farmers throughout the Blackland problem area.

CULTURAL METHODS ON TERRACED AREAS

The Chapman farm consisted of 33 acres divided into two nearly equal fields. The topography and soil of these fields are very similar, but field E was plowed and cultivated parallel with the terraces with point rows approximately halfway between the terrace ridges and field W was plowed and cultivated parallel to the boundaries of the field and across the terraces at random. Soil and water losses were measured from terraces E–2 and W–2. The results for the period of record, 1933–1936, presented in appendix, table 17, show less soil loss from E–2, cultivated parallel with the terraces, than from W–2, cultivated across the terraces. The cost of farming on the contour or parallel with the terraces was slightly greater than where crop rows crossed the terraces at random or parallel with the fences. Farming across the terraces materially lowered their height with the result that they were overtopped on numerous occasions, while those cultivated on the contour were not overtopped.

Effects of Cropping Practices on Runoff and Erosion

ROTATION AND CONTINUOUS CROPPING

The data presented in table 3 show that crop rotation is effective in reducing runoff and erosion. The better control exhibited by the rotated plots as compared with results from the continuous corn plot was due principally to the inclusion of oats, an erosion-resistant crop, in the rotation.

Table 3.—*Average annual soil and water losses from crop rotation plots*

Plot [1]	Treatment	Land slope	Area	Average annual rainfall	Run-off	Runoff in percentage of rainfall	Soil loss per acre
	Rows down slope:	*Percent*	*Acres*	*Inches*	*Inches*	*Percent*	*Tons*
19	Cotton-corn-oats	2	0.0286	33.77	1.94	5.74	3.9
20	Corn-oats-cotton	2	.0286	33.77	3.39	10.04	5.8
21	Oats-cotton-corn	2	.0286	33.77	3.27	9.67	6.1
22	Continuous corn	2	.0286	33.77	3.37	10.76	7.8
	Rows on contour:						
5	Subsoiled (1930 only); Corn-oats-cotton.	4	.01	32.74	1.53	4.7	3.9
	Rows down slope:						
7	Green manure 1930; cotton-corn-oats	4	.01	32.74	3.08	9.40	12.8
9	Green manure 1930; Oats-cotton-corn	4	.01	32.74	4.05	12.38	16.0
3	Continuous corn	4	.01	32.74	4.46	13.6	20.6

[1] Plots 19–22, 9-year period—1933–41. Plots 5, 7, 9, and 3, 11-year period—1931–41 inclusive.

Apparently there was no residual effect from the oats in the rotation. From figures 21 and 22, it can be seen that corn in the rotation lost as much soil and water as continuous corn. This indicates that the soil and water conserving effect of the rotation was due largely to the cover afforded by the oats when it actually occupied the land.

STRIP CROPPING

Because of the large size of plots 23, 24, and 25, on corresponding soils and slopes and their similarity to field conditions, erosion data from the plots are shown in figure 25 for information concerning the effects of strip cropping and the direction of rows.

The heaviest soil losses from plot 23 with four strips were incurred when the strip at the bottom of the plot was planted in cotton. The soil loss from this plot was materially reduced when the bottom strip was in oats. A 2-year rotation of cotton and oats was used on this strip-cropped area. Table 4 shows that this strip cropping materially reduced the soil loss as compared with that from rows up and down the slope, although some gullying was experienced in the strip-cropped plot. A comparable terraced area showed that the proper disposal of

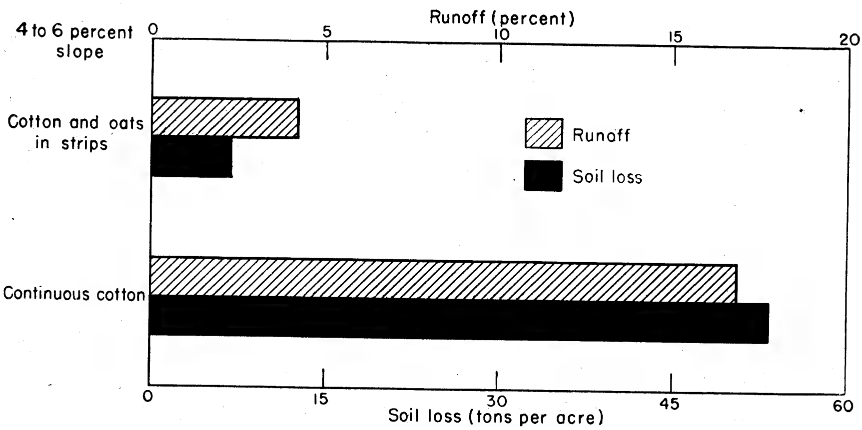


FIGURE 25.—Average annual soil loss from cotton and oats in strips on the contour and from continuous cotton rows down slope.

runoff water resulted in a greater reduction of soil losses on slopes as steep as 4 to 6 percent.

TABLE 4.—*Comparative soil losses under different cultural treatments, 5.5-year period, July 1933–December 1938*

Field treatment	Land slope	Average annual soil loss per acre
	Percent	*Tons*
Rows down slope (common practices)	4 to 6	53.34
Strip-cropped area	4 to 6	6.54
Terraced area	5.4	3.81

The smaller plots have shown that crop rotations containing small grain are effective in reducing soil and water losses. Results from such plots have also indicated the effectiveness of strip cropping in conjunction with crop rotation in further reducing soil and water losses. In 1938 the plots in fields O and P were prepared and field areas were laid out to study further the soil conservation practice of

strip cropping with special consideration of its design as to width of strips and its limitations as to steepness and length of slope. Three years' results from field O and P plots are presented in table 5. The 3-year rotation of cotton, oats, corn lost 5 times as much soil on the 3-percent slope as on the 2-percent slope and the same rotation strip-cropped lost 3 times as much on the greater slope (figs. 26 and 27).

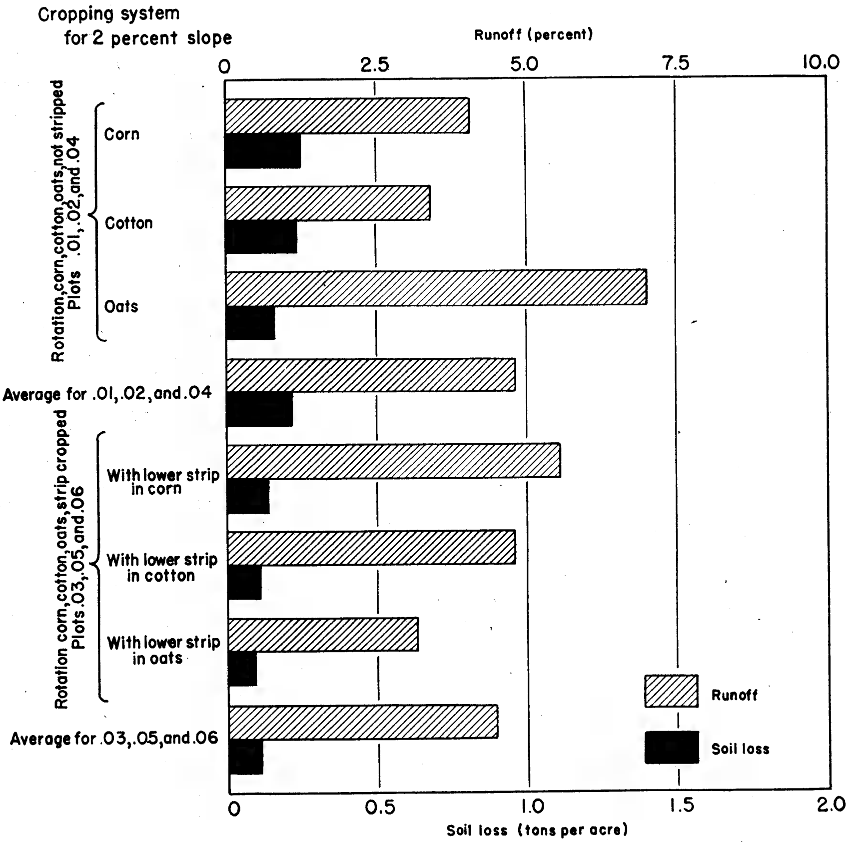


FIGURE 26.—Average annual soil and water losses 3-year period 1939–41 from rotation and strip-cropped areas, field O. Average annual precipitation, 35.12 inches.

The soil losses from the rotation and strip-cropped rotation on the 2-percent slope were both small, being only 1.05 tons per acre per year and 0.55 ton, respectively. The rainfall lost as runoff was about the same for both treatments. The 3-percent slope in rotation lost 3½ times as much soil as where it was protected by the strip-cropped rotation. The losses were 5.30 tons per acre per year and 1.57 tons, respectively. The runoff was 40 percent higher from the unprotected rotation than from the strip-cropped rotation.

TABLE 5.—*Average annual soil and water losses, 3-year period, 1939 to 1941, from a contoured rotation and a similar rotation strip-cropped*

Field	Average slope	Treatment	Average annual rainfall	Runoff	Runoff in percentage of rainfall	Soil loss per acre
	Percent		*Inches*	*Inches*	*Percent*	*Tons*
		3-year rotation, cotton, oats, corn:				
O	2	Contoured	35.12	1.70	4.85	1.05
O	2	Strip-cropped	35.12	1.58	4.51	.55
P	3	Contoured	34.85	3.52	10.09	5.30
P	3	Strip-cropped	34.85	2.53	7.27	1.57

The concentration of water on the 3-percent slope was sufficient to cause severe gullying on both plots, that in simple rotation, and that which was strip-cropped. During severe storms the rows broke,

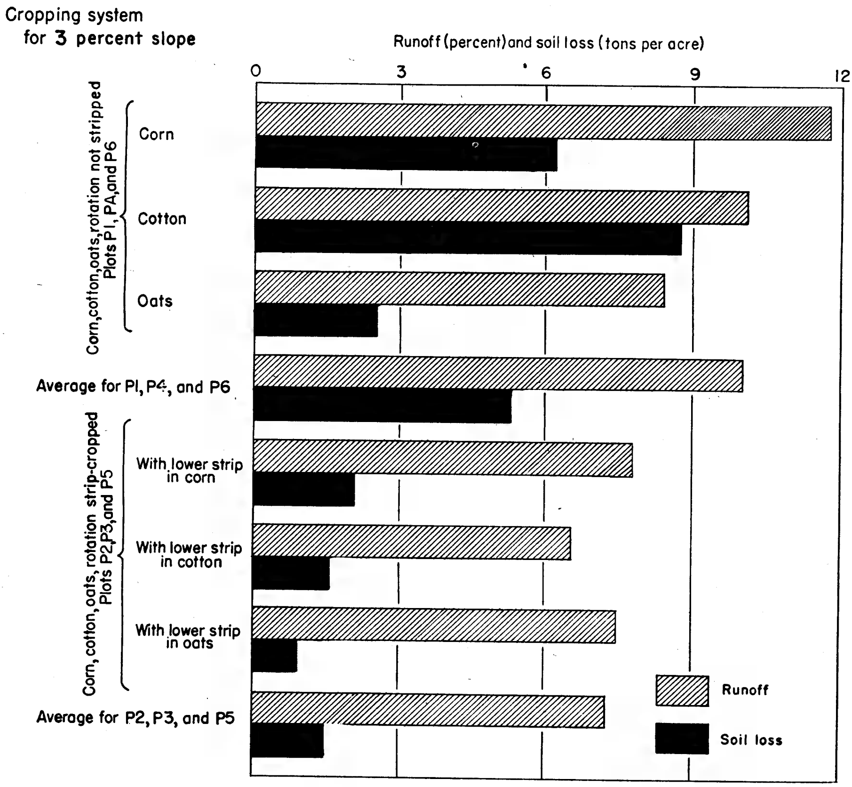


FIGURE 27.—Average annual soil and water losses 3-year period 1939–41 from rotation and strip-cropped areas, field P. Average annual precipitation, 34.85 inches.

even on the 2-percent slopes, and small gullies extended from the top to the bottom of the 432-foot plots.

Records of field observations and measurements were made after each rain on the 1½ acre O and P plots and on strip-cropped fields with slopes ranging from 2 to 4 percent and with different widths of

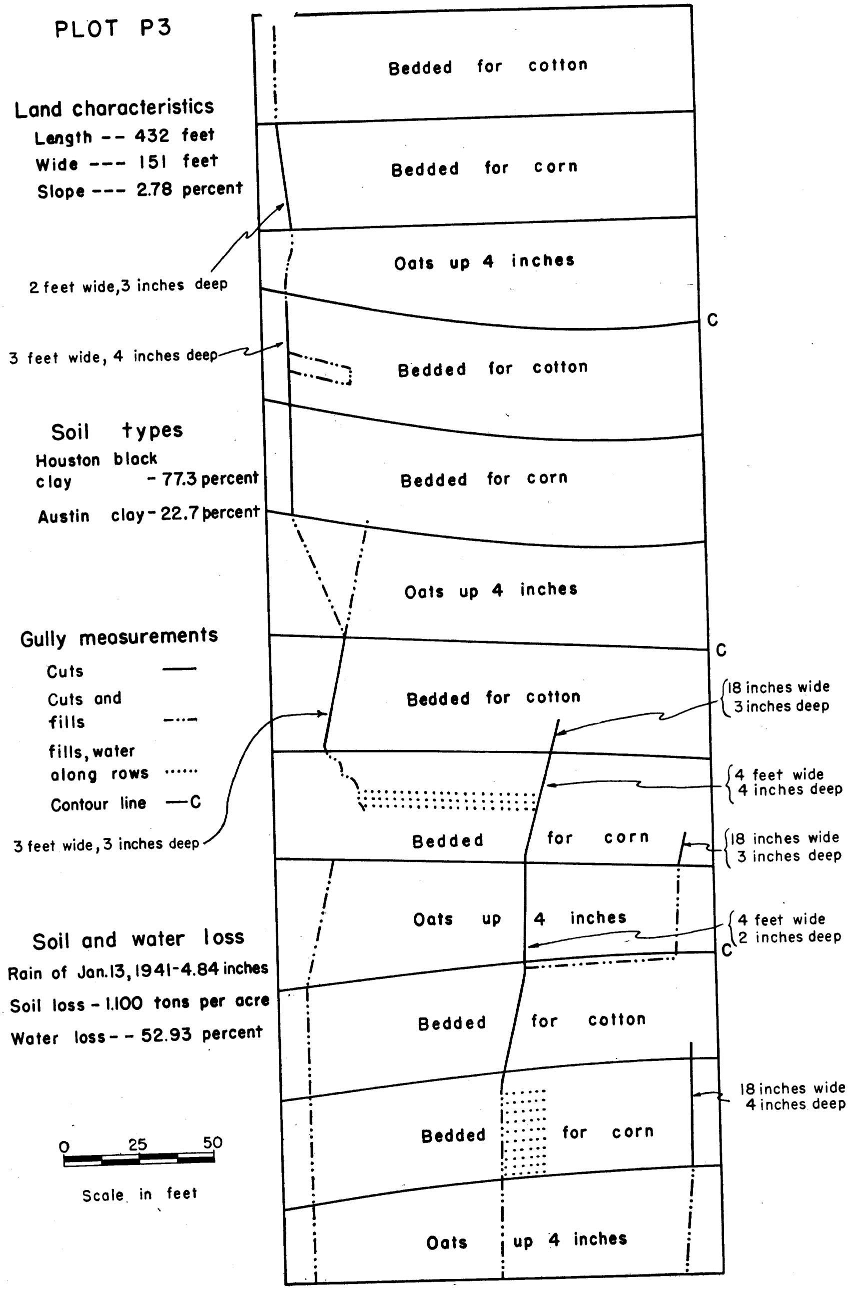


FIGURE 28.—Gully survey map of a strip-cropped area, plot P 3.

crop strips. Figure 28 shows the method used for recording these data in diagrammatic form. These studies indicate that:

(1) Once the contoured rows break and a gully starts, 36-foot erosion-resistant strips of oats do not successfully disperse the accumulation of water and gullying continues immediately below the oat strips (fig. 29).

(2) On land slopes greater than 2 percent accumulated water on strip-cropped land is sufficient to cause recurrent gullying in the

FIGURE 29.—Typical gully as mapped on figure 28. C-8364

same depressions. This indicates a need for terraces to divert water to protected outlets.

EROSION-RESISTANT CROPS FOR STRIP CROPPING AND FIELD BORDERS

On the strip-cropped fields, last referred to, the three resistant crops used in the strip-cropping systems are oats, broadcast sorghum, and little bluestem for hay. The studies confirm the control-plot indications that small grain, in this case oats, is the most effective cultivated erosion-resisting crop because its cover is effective during the winter and spring months when the largest number of erosive storms occur in this area. Grain sorghums, while effective later in the season, are young and not at their best erosion-resisting capacity during the spring months. Little bluestem furnishes perennial cover and can be effectively used in a strip-cropping system, not only to form an erosion-resisting strip, but also to take up the point rows that normally occur in a contoured field (fig. 30). This system is convenient from the farmer's standpoint because all his rows are then the full length of the contour guide lines.

Even the system of using perennial grass, such as bluestem, for the erosion-resisting strip is not sufficient to prevent the accumulation of water in depressions and the continuation of gullying between the grass strips. This information was obtained on a 4-percent slope where the horizontal distance of 162 feet between the grass strips was planted to a 3-year rotation of cotton, oats, corn, in 54-foot strips. In a farm set-up that could use a large amount of grass hay the system of strip cropping with perennial grasses would be much more adaptable. The practice of planting a border strip of small grain, or perennial hay grasses, around the outer margins of cultivated field areas is successfully serving a threefold purpose. It provides a turning area that is protected against erosion; some of

C–8373

FIGURE 30.—Erosion-resisting strip of little bluestem grass 1 year after planting This strip eliminates point rows in the strip-cropped field.

the soil washed from the field is caught instead of being washed into road ditches, streams, or adjoining farms; and it provides cover for wildlife on the farm.

STRIP CROPPING WITH TERRACES

Two years' records have been obtained from terraces with strip cropping as compared with terraces without strip cropping (appendix table 17. The terraces in solid row crops are planted to a cotton-corn rotation. The same rotation is followed on the strip-cropped terraces, except on the strips located immediately above the terrace channel, and planted to oats each year (fig. 31). There are two terraces in each treatment. The average annual soil loss from the strip-cropped terraces was 1.2 tons per acre as compared with 2.5 tons per acre for the row-cropped terraces. The water lost from the strip-

cropped terraces was 16.4 percent as compared with 20.8 percent of the rainfall lost as runoff from the row-cropped terraces. These data indicate that the combination of strip cropping with terraces is more effective than either of these soil-conserving measures alone. It is questionable, however, whether the 1 ton of soil saved by adding the strip-cropping system to the terracing is sufficient to offset the

C-8370

FIGURE 31.—Strip cropping with terraces.

inconvenience of farming with and harvesting the erosion-resistant strip of oats on the terraced land.

DESIGN, MAINTENANCE, AND BEHAVIOR OF TERRACES

Comparison of the quantity of soil removed by erosion from terraced and unterraced areas serves a valuable purpose in indicating the effectiveness of control by terracing. Records of losses of soil are taken at the ends of terraces and are very useful in comparing the effectiveness of terraces of different types, sizes, and gradients.

A considerable part of the soil eroded from the upper parts of the interterrace areas is deposited in the terrace channels and does not pass on with the runoff through the measuring devices at the ends of the terraces. Through the adoption of a maintenance system in which the soil deposited in the terrace channels is plowed up slope, the movement of soil by erosion across terrace intervals may be greatly reduced, and, of course, good rotations, the use of seasonal cover crops, strip cropping and other soil-stabilizing measures still further reduce the losses.

TERRACE SPACING

The soil losses in runoff from the terraces used in the spacing study for the period of record are shown in table 6. A more complete record of these terraces is presented in appendix, table 17.

All terraces, except those on field C, numbered C–5, etc., were located on leased land adjoining the present farm. The leases were terminated at the conclusion of the terrace studies in 1939.[6]

TABLE 6.—*Average annual soil and water losses from terraces with various vertical intervals*

Terrace [1]	Vertical interval	Length	Horizontal spacing	Average land slope	Average annual rainfall	Runoff	Runoff in percentage of rainfall	Soil loss per acre
	Feet	*Feet*	*Feet*	*Percent*	*Inches*	*Inches*	*Percent*	*Tons*
C–5	3.0	850	52.9	5.4	32.85	3.63	11.05	2.15
C–6	4.0	844	74.6	5.4	33.67	3.77	11.19	2.82
C–7	5.0	828	94.1	5.4	32.87	3.67	11.16	3.85
A–15	2.3	905	63.3	3.6	30.90	4.87	15.77	3.36
A–16	3.0	896	90.4	3.1	30.96	2.95	9.54	1.90
A–17	4.0	749	129.5	3.1	31.52	4.64	14.71	5.24

[1] Period of record for C–6, 1932–41; for C–5 and C–7, 1931–41; for A–15 and A–16, 1931–39; for A–17, 1932–39.

The average trend indicates that soil loss increased with increase in vertical interval between the terraces. Apparent inconsistencies were due to unavoidable variables that affected the experiment. When the experiment was installed available land was too limited to permit an ideal location. Terrace A–15 with a 2.3-foot vertical interval is on a slope transition that is a little steeper than the slopes of terraces A–16 and A–17 with 3.0- and 4.0-foot intervals, respectively, and its watershed is smaller and narrower. These variations, together with some variations in soil conditions, are believed to have accounted for the relatively large soil loss from terrace A–15. Terrace A–17 in addition to having the widest vertical interval of the three terraces, has three old washes or gullies, which constituted a condition not present on the other areas. The soil loss from terrace A–16 was extremely low. Several variable factors are believed to have contributed to this condition, but evaluation of the effect of each is impossible.

From the data presented in table 6 and from field observation of terraces with various designs it was observed that with terraces spaced closely tractor-farming operations were more difficult, and more surface soil was moved in the building process. It was also observed that there was a greater tendency for gullying in the interterrace area as the vertical interval was increased. The intervals of 2.5 to 3.5 feet as recommended by Bentley (*2*), and Henry (*6*) performed satisfactorily at this station. Attention is called to the fact that the maximum land slope on the station is limited to 5.4 percent.

TERRACE LENGTH

Observations during periods of heavy runoff where water ran 16 inches deep through a 2-foot flume at the end of a 1,971-foot terrace

[6] HILL, H. O. PROGRESS REPORT OF SOIL AND WATER CONSERVATION INVESTIGATIONS, BLACKLAND EXPERIMENT STATION, TEMPLE, TEX. 27 pp., 1940. (Interoffice report.)

indicated that the safe maximum length for terraces in the Blackland problem area is approximately 2,000 feet (the maximum under observation). On longer terraces danger of overtopping is increased because of concentration of water and the depth of flow of water in channels near outlets. Should a greater length be necessary the cross section and height of the terrace should be increased for a distance of several hundred feet next to the outlet. The larger dimensions necessitated by a length of over 2,000 feet add to the difficulty of farming operations.

Data from terraces of various lengths indicate that there is no optimum length of terrace from the standpoint of soil and water loss. The location of a desirable and economical terrace outlet, in most cases, determines the length of terraces.

TERRACE GRADES

The terraces of the station have uniform or variable grades ranging from 0 to 5 inches per hundred feet. Because of the presence of uncontrolled variables the terraces with grades greater than 3 inches per 100 feet cannot be compared with the other terraces. Near the outlet end of the terraces with grades over 3 inches per 100 feet the slope flattens considerably and a large settling basin is formed in the terrace channel when the depth of flow is of appreciable magnitude.

Considering all factors, soil losses from the variable-grade terraces were somewhat less than those from the uniform-grade terraces. Results indicated that soil losses decreased with decrease in grade. (See appendix table 17.)

Level terraces, 18 inches high with closed ends, had their channels completely filled with water and all the ridges were overtopped. All closed-end level-terrace sections ponded water a sufficient length of time to drown out crops. Tile drains were installed 2 feet deep under closed-end level terraces, but after the first few rains the soil sealed over to such an extent that there was no apparent drainage of the impounded water through the tile drains. The terraces with tile underdrainage held water as long as the sections without drains.

Level terraces with one end open and terraces with 1-inch grade lost approximately 1 ton of soil per acre per year and approximately 6 percent of the rainfall as runoff. The saving of moisture was not necessarily reflected by increased crop yields. The water held in the channels of these terraces had a tendency to drown out crops and impede farming operations during wet years; otherwise the terraces performed satisfactorily. The terrace with a variable grade from 0–3 inch per 100 feet lost 2 tons of soil per acre per year and 11.5 percent of the rainfall as runoff. There was no interference with farming operations. The terrace with a constant 3-inch grade per 100 feet lost 3 tons of soil per acre per year and 12.8 percent of the rainfall as runoff.

TERRACE MAINTENANCE

Terrace maintenance is as important as the original construction. The installation of a terrace system that is not maintained may do more damage than would have occurred had the field remained unterraced. Maintenance of terraces can be performed by an adaptation of normal tillage practices without the necessity of special operations purely for terrace maintenance. However, they may also be maintained by

special operations using plows or the blade-type graders. Figure 32 shows a cross section of terrace C-6 terrace interval and includes also terrace C-5. The profiles shown were taken in 1931, shortly after construction, in 1938 after necessary maintenance using blade-type maintainers, and again in 1942. Between 1937 and 1942, maintenance was very satisfactorily obtained by flat breaking with the back furrow falling on the center of the terrace ridge, and the dead furrow near the center of the terrace interval. The lowering of the soil elevation by this location of a dead furrow can be prevented somewhat by plowing lands in such a way that a dead furrow falls in the terrace channel while the back furrow remains on the ridge.

It will be noted from figure 32 that the original base width of the terrace was only about 18 feet, and that by process of maintenance a recommended settled height of 18 inches has been well maintained and the base width has been increased to 28 feet. This broadening of the

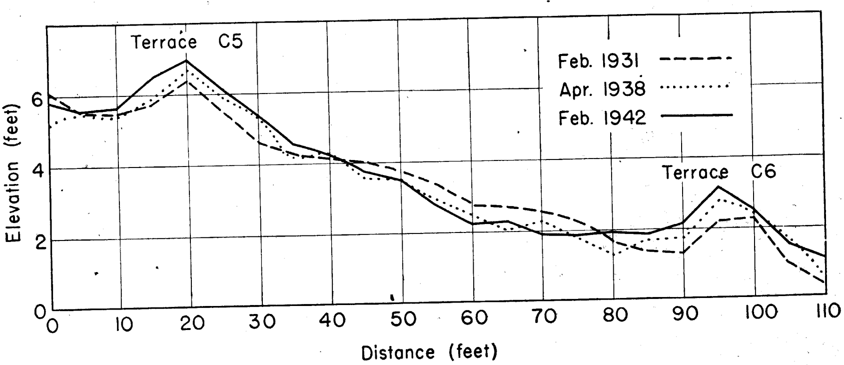


FIGURE 32.—Cross section of terraces C-5 and C-6, showing profiles taken in 1931, after terraces were completed; in 1938, after 7 years maintenance with a blade grader; and in 1942 after 4 years maintenance by flat breaking only, with the back furrow on the terrace ridge.

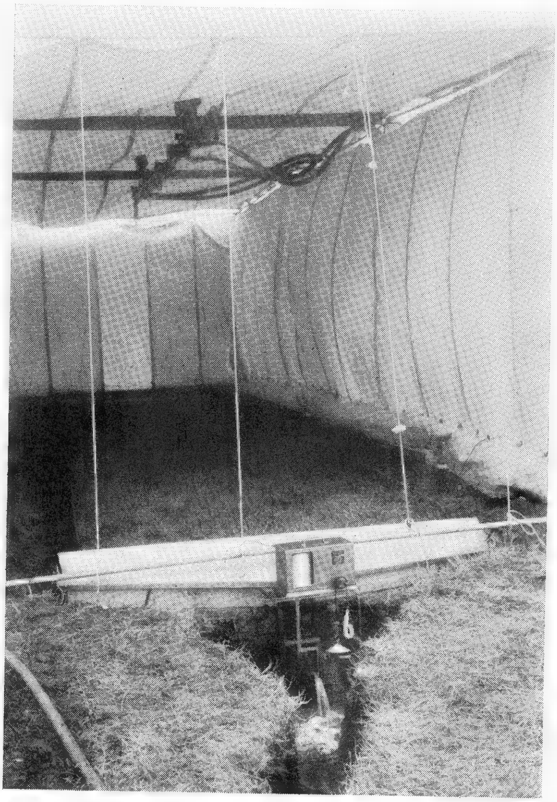
terrace base has been accompanied by more efficient use of 2-row power machinery on terraced land.

OPERATION OF FARM MACHINERY ON TERRACED LAND

The efficiency with which farm machinery can be operated on terraced land varies with the skill and experience of the operator, the width of the terraces, and the design of the machinery. Within the last decade the operation of farm machinery, parallel to and on terraces, has become an accepted method with the use of terraces in this area. The skill of the operators has improved with experience and the increasing compactness of tillage machinery design has increased the efficiency with which it can be used on terraced land. All of the machinery normally used in this area can be used satisfactorily for farming terraced land. The only difficulty experienced is with the use of such items as: grain drills, binders, and ganged spike-tooth harrows. The operation of such machines could be improved by designing for greater flexibility, but in spite of their lack of flexibility they have been successfully used on the station. Operation in strips parallel to the terraces tends to offset their rigidity.

MAINTENANCE OF OUTLET DITCHES

Pioneering work was done at this station on controlling erosion in terrace outlets and terrace-outlet ditches. Work was done both with the use of vegetation and mechanical structures. This early work [7] has been considerably augmented by the installations made by the Operations Division and the experiments conducted by the Hydrologic Division of the Soil Conservation Service.[8] Observations have been that a wide, shallow, well-sodded natural depression extending up into the cultivated field offers the best solution for terrace outlet problems. This type of drainageway can be prepared without a complex design and it can be well maintained by mowing or controlled grazing. The principal work on this subject now being done at this station, is limited to a study of the characteristics of various grasses which might show adaptability for use in vegetated terrace outlets. These data are reported under, Rebuilding Eroded Land.



C-8374

FIGURE 33.—Overhead spray-type rain simulator, used for applying water at a uniform rate to 6- by 24-foot plots.

INFILTRATION STUDIES

In 1932 terrace A–19 was subsoiled to a depth of 28 inches. For a few rains the result of this operation gave a noticeable increase in the amount of water infiltrating the soil profile. After that the soil sealed over and there was no appreciable difference in the runoff and soil loss from terrace A–19, as compared to the companion terrace A–18 (appendix, table 17). Subsoiling on the control plots likewise gave no noticeable difference in resulting soil and water losses. The dry-weather cracking of the heavy Blackland soils is a natural process which simulates subsoiling to such an extent that no lasting benefits should be expected from subsoil tillage practices.

[7] DEETER, E. B., and HOPKINS, P. L. PROGRESS REPORT, OF THE BLACKLAND SOIL AND WATER CONSERVATION EXPERIMENT STATION, TEMPLE, TEX., 1931-36. U. S. Soil Conserv. Serv. ESR-7, 66 pp., illus. 1938. [Processed.]

[8] BURT, R. L. TESTS OF BERMUDA GRASS CHANNEL LININGS. PRELIMINARY RELEASE OF DATA STUDIES IN CONSERVATION HYDRAULICS. U. S. Soil Conserv. Serv. Hydrol. Div. Release 3, 11 pp. 1939. [Processed.]

The soils of the Blackland area, such as Houston black clay and Austin clay, seal over and become more or less impervious with continued applications of water, either naturally or artificially (fig. 18). Some preliminary work has been done to study the effect of a straw mulch on infiltration of water into the soil. Rainfall simulator Type D–1 (fig. 33) was used to apply water to 6- by 24-foot plots, flat-broken, and flat-broken but covered with a 2-ton per-acre layer of straw mulch on the surface. The water was applied at the rate of 3.3 inches per hour until a constant rate of infiltration was reached for at least a 20-minute period. The first run on a plot is called the dry run. A wet run was made 24 hours later. (See appendix, table 19.) The straw mulch plot took considerably longer to reach the constant

FIGURE 34.—Furrow damming as used on experimental areas.

rate of infiltration for the dry run than did the flat-broken plot without mulch. There was very little difference between the wet runs either as to time required to reach constant infiltration or the rate of constant infiltration, which was low, having been approximately 0.5 inch per hour in both cases. Under wet-run conditions the soil lost in the runoff water was four times as high from the flat-broken plot as from the plot treated with the straw mulch.

The rain simulator was also used in a like manner to apply water on sodded areas of Bermuda grass, buffalo grass, and a native meadow. The first runs required considerable time to reach the constant infiltration rates. The wet runs reached the constant infiltration rate in relatively short times and runoff rates greater than 90 percent of the water applied were experienced from these excellent erosion-resisting grass covers. The soil loss was very small. Since all effort to make the water go into the soil by mechanical means, such as subsoiling, showed little result, an experiment was started to provide additional

surface storage so that the rainfall could have greater time in which to soak into the soil profile. On plot Series M, triplicate plots were prepared to study the effect of flat breaking with flat planting, contour listing, and contour listing, furrow-dammed (fig. 34). This study has been in progress only 1 year, 1941; hence, no conclusion can be made at this time.

SOIL MOVEMENT

Concrete bench marks extending 5 feet into the ground were prepared as markers for soil-movement lines on the terraced and unterraced land. Profiles are run periodically along these lines to study the soil movement down slope as affected by tillage practices. It was found that the bench marks were rising and settling with the expansion and contraction of the soil profile. To study this phenomenon concrete bench marks were set extending 3, 5, 8, 10, 15, and 20 feet into the soil, the latter being used as a datum plane. During dry weather these bench marks settled and during wet weather they rose, indicating that the entire soil profile contracts and expands with varying moisture content. During 1 year the 3-foot bench mark alternately moved approximately ¾ inch up and ¾ inch down—a total movement of 1½ inches. The 5-foot bench mark moved a total of 1 inch. The 8-, 10-, and 15-foot markers have all moved slightly, but their total movement is less than ⅛ inch. At the location of these bench marks the black topsoil horizon is approximately 2 feet deep and grades into chalky marl underneath.

From the soil-movement lines it is evident that there is considerable mechanical displacement of soil caused by land-breaking operations in which the dead furrow is left in the same location year after year. Tillage operations cause a change in surface elevation, the highest elevation occurring when the land has been recently flat-broken or listed. Changes in surface elevation caused by expansion and contraction of the soil and by tillage operations make the soil-movement lines of little value in determining soil losses or mass soil movements, unless the soil loss or movement is of sufficient magnitude to offset these variations. The change in average surface elevation, induced by tillage operations and the contraction and expansion of this soil type has been as much as 0.13 foot within 1 year. This variation is 13 times the average measured soil loss for the 9-year period of record, 1931–39.

CROP YIELDS

Crop yields have been recorded for all areas on which soil and water losses are measured and are given in appendix table 17. The crop yield data from the small unreplicated plots should be used with discretion, since variations in stand and the prevalence of cotton root rot disease may cause yields to vary widely. The yields from the larger plots and field areas are more representative and reliable.

The surface soils of this area are relatively deep on the gentler slopes. In the construction of terraces some black soil often remains in the terrace channels even though a large amount of surface soil is moved. In 1932 yields were taken across the terraces in field B on Houston black clay soil, the interval being divided into the ridge, channel, and interterrace areas. The average per acre yield from the ridge and the channel combined was approximately equal to the

yield from the undisturbed interterrace area. On the upper part of the field the topsoil was thin and the subsoil was reached in constructing the terraces in 1930. On this area the increased yield on the terrace ridge compensated for the decreased yield in the channel. On the lower part of the field, where the top soil was deeper and the subsoil was not reached in the construction of the terraces, there was no appreciable difference in the rate of yield from the three areas.

Three years' crop yields were taken by soil types, Houston black clay, Austin clay and Austin clay, shallow phase, and by erosion classes: 0–25 percent of the topsoil removed; 25–75 percent of the topsoil removed; and 25–75 percent of the topsoil removed with occasional gullies. It was found generally that yields decreased as the degree of erosion increased. There was very little difference in the yielding ability of Houston black clay and Austin clay with the same degree of erosion. Austin clay, shallow phase, was the lowest yielding of the soils under study. The highest yields were obtained from Houston black clay with 0–25 percent of the topsoil removed by erosion.

In an economic survey of crop yields from terraced and unterraced land in the Elm Creek Watershed, near Temple, Tex., made for 1936–39, it was found that terraced land produced about 33 percent more cotton and 14 percent more corn than did unterraced land.[9]

In a study of yields from strip-cropped rotations, as compared to rotation alone, on plots in fields O and P over the 3-year period 1939–41 it was found that in general the yields for cotton were slightly less in the strip-cropped plots than on the solid cotton plots. There was very little difference in the yield of oats or corn.

REBUILDING ERODED SOIL

The problem of soil conservation involves the rebuilding of severely eroded areas as well as the reduction of soil erosion. After excessive erosion has been stopped the next step is to bring back the productive capacity of the protected land.

Results from the Texas Agricultural Experiment Station, Blackland Substation No. 5, have shown that in general the Blackland soils do not respond to commercial fertilizers sufficiently to pay for the cost of fertilization, but good response is obtained from legumes, green-manure crops, and barnyard manure. Barnyard manure is not available in quantity, in this area, because of the practice of running livestock on pasture the entire year. Legumes do not grow well in the winter. Late-maturing and perennial legumes are damaged severely by cotton root rot in the summer. Hubam clover and selected strains of cowpeas offer the best possibilities for soil-building purposes. On eroded Austin clay, one year's results, 1941, showed about 40 percent increase in the yield of cotton following Hubam as compared with cotton after corn. But yield of corn after Hubam Clover was about the same as corn after cotton.

Land too severely eroded to remain in cultivation can best be protected and subsequently utilized in this area by revegetation to grasses. One hundred twenty species (appendix, table 20) of grasses have been under observation at this station to determine the pos-

[9] BATES, C. H. Unpublished correspondence on Elm Creek Watershed, Temple, Tex. U. S. Soil Conserv. Serv. 1939.

sibilities for their use in soil conservation (fig. 35). They are being studied for possible use in the vegetation of waterways or in the revegetation of severely eroded areas. Many of the native species and some introduced species show considerable promise. Of the sod-forming grasses, buffalo grass (*Buchloë dactyloides*) shows the greatest promise for use on the uplands of the problem area; several strains of Bermuda grass (*Cynodon dactylon*), are outstanding for use on the lowlands. These two grasses are adapted for control of terrace-outlet waterways and revegetation and they are also excellent base pasture grasses. Little bluestem (*Andropogon scoparius*), big bluestem (*Andropogon furcatus*), Indian grass (*Sorghastrum nutans*), and side-oats grama (*Bouteloua curtipendula*), are desirable native grasses for

C–8371

FIGURE 35.—Area devoted to a study of grass types for special soil conservation purposes.

revegetation and meadow. Three other perennial grasses show unusual promise for this purpose, since they furnish late-winter or early-spring grazing. These are Harding grass (*Phalaris tuberosa*), early meadow fescue (*Festuca elatior*) and reed canary grass (*Phalaris arundinacea*). The principal grass need for this territory, in addition to their soil-conserving ability, is adapted perennial varieties which will give an abundance of winter grazing when Bermuda grass and buffalo grasses are dormant.

CONSERVATION THROUGH LAND USE

Wise use of land is conservation and the wisest land use is that which produces the greatest income without depleting the soil. In the Blackland region many small areas are not suitable for cultivation because excessive wetness in normal and heavy rainfall years makes

C-8357

FIGURE 36.—Typical condition that existed on the station pasture area before the introduction of sheep.

C-8358

FIGURE 37.—Same pasture, as shown in figure 36, after conservation management.

cropping uncertain. The station has 34 acres of such land along a small creek that runs through the farm. After fencing in 1937, 150 sheep and 20 head of Hereford steers were put on this area. The cattle produced 340 pounds of beef per acre in 1940 on their allotted portion of this acreage. On their apportioned acreage the sheep produced $22.70 per acre, excluding labor costs. This formerly idle land, put to proper use, now produces a grass crop that can be marketed through livestock and the area that was once a weed patch now looks like a well-kept lawn (fig. 36 and 37).[10]

On a part of an 8-acre native meadow on the station, sheep were grazed intermittently to control weeds. It was observed that the quality of the hay on the grazed area was considerably better than on the ungrazed. There was, however, some decrease in the quantity of hay produced where the sheep were used.

APPLICATION OF RESULTS TO LAND USE METHODS FOR THE BLACKLANDS AND SIMILAR AREAS

The Blacklands present a difficult problem in soil conservation and one that is distinctly different from that of other problem areas. Topography, which in most cases demands major consideration, both as to the cause and control of erosion, does not appear to be unfavorable in the Blacklands. The difficult conservation problems of this area are created by the unusual characteristics of the soils and their reactions to the rainfall and to temperature extremes that occur in this mid-Texas location. The Blackland soils of which the Houston and Austin are typical are high in colloidal clay and are subject to excessive swelling and contraction under the influence of wetting or drying, respectively. Infiltration-rate tests have shown that the surface rapidly seals over during the early stages of wetting and that undisturbed wet soil has a very low infiltration rate. The percentage of rainfall lost as runoff from the typical rainstorm is high, creating an erosion hazard on even the most moderate slopes. During dry weather or droughty spells the loss of soil moisture, through natural drying processes and from plant use, causes the soil to contract. Such periods are marked by the appearance of many large cracks in the soil. These cracks assume startling proportions often being several inches wide and several feet deep. It is not possible to estimate length of the cracks, as they often join into each other, forming a reticulate pattern on the field. The areas between the cracks become hard and compact. When rains fall on soil in this condition the infiltration rate is low and most of the water escapes as runoff into the cracks. Gullies may be started along the lines of these cracks, before they are closed by the swelling action of the wet soil.

Crops on the Blackland soils have not responded to applications of commercial fertilizer to a sufficient degree to make such applications practical, but they have shown a marked response to additional organic matter applications, either in the form of barnyard manure or as green manure. However, the presence of the cotton root rot organism (*Phymatotrichum omnivorum*) in the soils of the entire Blackland area makes it very difficult to grow legumes in the rotation or for green-manuring purposes.

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[10] TEXAS AGRICULTURAL EXPERIMENT STATION. SOME SERVICES RENDERED TO FARMERS AND RANCHERS. Tex. Agr. Expt. Sta. Unnum. Pub., 19 pp., illus. 1941.

Root rot attacks over 100 different species and varieties of plants, including all the commonly grown legumes. Its presence makes it impossible to grow red clover, biennial sweetclover, alfalfa, and even the annual lespedezas successfully. Recent experimental results secured from areas on which the annual white sweetclover, Hubam, was grown, indicate that it may be possible to use this legume for soil improvement and erosion-control purposes as it appears to make satisfactory early spring establishment and growth before the soil temperature is high enough to support vigorous attack and development of root rot. But this short-lived annual legume, however valuable it may prove to be for soil-improvement purposes, does not fill the need for a perennial legume capable of growth either with or without grasses for permanent meadow use. Neither are there any of the cultivated perennial meadow grasses available that are capable of forming grass meadow of sufficient quality to be practical.

The lack of suitable legumes and grasses for meadow places a drastic limitation on the types and lengths of rotations that may be used for conservation purposes. Winter oats has been the most successful and about the only uncultivated grass-type crop available for use in rotations with corn or cotton and for erosion-resistant strips in strip-cropped fields.

The efficiency of winter oats in controlling soil and water losses can be extremely variable depending on when they are planted, rapidity of growth, and the occurrence of rain during the vulnerable soil period of the oats cycle, but, in the main, annual soil losses from oats during the 10 years of record on the Temple station have been low. During the first 5 years of record, losses did not exceed 1 ton per acre and, except for 1 year, losses have not exceeded 3.5 tons per acre on 4-percent sloping land during the entire 10 years of record.

The limitations in the use of a wide variety of grasses and legumes, created by soil characteristics, climate, and cotton root rot, has made it difficult to acquire the degree of erosion control by vegetate means for the Blackland soils, which might otherwise be secured on lands of similar topography. As a consequence more use and dependence upon mechanical controls and tillage methods must be resorted to than is common on lands under less limiting conditions.

The 10 years of research at the Blacklands station, as shown in this report, have yielded evidence that many conservation practices may be applied effectively on the Blacklands and similar areas. Applications of specific conservation practices for use in the Blacklands area are:

Crop rotation.—Crop rotations when they include small grain are conducive to decreased soil and water losses on all classes of land and to increased crop yields when they include legumes.

The percentage of row crops in the rotation will be governed by the susceptibility of the land to erosion and by the productive capacity of the soil.

Vegetatal cover.—Plants or plant residues giving protective cover during winter and spring months will reduce soil losses.

Contour cultivation.—Contour tillage alone is not recommended. Contour tillage is advisable where strip cropping or terraces are used.

Strip cropping.—Strip cropping is effective in control of soil losses on slopes of less than 3 percent and not greatly exceeding 400 feet in length. Strip cropping on slopes of 3 percent or more and over 400

feet long will decrease soil loss to some extent but soil losses and gullying will still be sufficiently severe that strip cropping cannot be recommended. On all slopes where contoured rows break, gullies start and continue immediately below the erosion-resisting crop strips.

On slopes over 2 percent when the contoured rows break accumulated water in field depressions is sufficient to cause recurrent gullying.

Terracing.—Terracing is conducive to decreased soil losses. The primary purpose of terraces on Blackland soils is to intercept runoff water and conduct it to protected outlets. Effective erosion control has been obtained by the use of terraces on all slopes up to 5.4 percent, which is the maximum on the station. In this problem area the economics of terrace construction or farm operations on terraced land will determine the feasibility of terracing, regardless of the land slope.

Protected terrace outlets must be provided for all terraces. Terraces should be maintained to an effective height of 18 inches or a channel capacity of 13 cubic feet per second. Maintenance can be done most economically by an adaptation of normal tillage operations.

Strip cropping with terraces.—Strip cropping with terraces is conducive to decreased soil and water losses. This combination is most satisfactory when the erosion-resisting strip is not less than one terrace interval wide.

Land use for special areas.—Creek bottoms and areas too wet for satisfactory cultivation may be used to produce a profitable crop of grass. Weeds must be kept in check by moving or controlled grazing with sheep to insure a good grass cover.

Gully control can be most economically accomplished by diverting the water from the heads of the gullies and revegetating the area with grasses. Some utilization of the revegetated area may be obtained through controlled grazing.

Land too severely eroded or otherwise unsuitable for cultivation can best be utilized by revegetation with grasses for subsequent limited grazing or wildlife cover areas.

These specific practices, within the limits of use as previously stated, can be used as the basis for land use recommendations for the Blacklands and similar areas. Conservation of soil and water and increased farm production can be secured if the following practical conservation measures are followed:

1. Selective cropping and the production of the higher income crops on the more productive land. For the Blacklands this practice is consistent with good conservation practices, because small grain crops, which are relatively good erosion-control crops, will be assigned to the steeper, less productive land and greater economic returns will be secured.

2. Crop rotations including small grain for reduction of soil losses.

3. Crop rotations including legumes for increased crop production. The use of legumes is highly desirable but difficult of attainment in the Blacklands area because the root rot organisms which are present in all Blackland soils, make the growth of most legumes impractical or extremely hazardous. The annual white sweetclover, Hubam has recently been tried and has shown promise of being root rot escaping because of the early growth secured before root rot develops.

4. Crops giving protective cover during the winter and spring months for reduced soil losses.

5. Grasses seeded or sodded to give protection against erosion on areas severely eroded and where other cropping is uncertain. They will also produce a marketable crop of forage.

6. Weed control on pasture or meadow areas can be obtained through the use of sheep. The effectiveness of vegetal cover of grass will not be impaired if good management is practiced and overgrazing prevented.

7. The use of terraces and strip cropping on erodible sloping land

8. Contour cultivation with strip crops or terraces to save moistur from small storms and as a more economical method of maintenance for terraces.

9. Terrace maintenance can be successfully accomplished by flat breaking in the course of regular farming operations by using the center of the terrace ridge as the back furrow. If the dead furrow is placed in the terrace channel more channel area will be provided.

10. Field border strips of grass or small grain, which provide space for turning at the ends of the rows, will reduce the amount of soil washed from the field and will provide cover for wildlife, another potential farm crop.

At the Blackland Substation No. 5, the Texas Agricultural Experiment Station is carrying out a well-rounded farm-management program in addition to the experimental work with crops and plant diseases. This program includes economic feeding projects for livestock, swine, and poultry. The most efficient marketing system for farm feed is through livestock and poultry products. The station animals utilize the grass crop produced.

DISCUSSION OF LAND USE PROBLEMS

The problem of soil erosion must be attacked first on the farm and it is the farm family that must first enjoy increased benefits through soil conservation if conservation practices survive. The continued use of soil conservation methods of farming will bring about increased crop yields and in turn increase individual farm and national farm income.

Today, because of unwise land use in the past, the soil resources of the Blacklands and of the Nation as a whole are deteriorating. The ultimate National objectives for the farmers of the Nation include a permanent prosperous agriculture that is based on wise land use and good farming practices. Wise use in conservation and good farming practices include the use of soil- and water-conserving measures. The results of soil conservation research show that for the Blackland and Grand Prairie region this ultimate national goal can be reached. Practical conservation measures have been developed that reduced soil erosion to such an extent that with good farming practices most of this area may be cultivated indefinitely and without a decline in production. It has been shown that good farming practices applied to this land after it has been protected against soil erosion will not only maintain yields but also will substantially increase them.

Unwise land use in the past has allowed soil erosion to deplete the soil resources in the Blackland area. Each ton of soil washed from the field carries with it approximately 3.6 pounds of nitrogen, 3 pounds of phosphorus and 10 pounds of potassium—3 essential plant-food elements, not to mention the unrecoverable loss of the soil itself (*7, 8*). Soil and water conservation investigations at the

Blackland Experiment Station have shown that this severe erosion can be materially reduced by practical conservation measures.

A complete conservation program for the Blackland area can be developed by the installation of one measure at a time. Some soil-conserving practices are easily installed, whereas, some require technical assistance. The main point to keep in mind is that each of the better farming practices started is one step nearer the ultimate objective of a complete soil conservation program for the farm.

Farming with the soil-conserving practices of terracing and strip cropping is easily continued with experience in operation. The practices of terracing and strip cropping are rather difficult to install and the services of a trained man are needed for this task. However, these are the two most effective soil- and water-conserving practices recommended for the Blackland area.

In the final analysis for the Blackland and other similar areas, represented by this station, the agricultural prospects, for the future, are very good. Through the establishment and maintenance of soil-conserving practices soil-erosion losses can be reduced to a low rate and the productive capacity of the soil can be maintained; the conservation practice of terracing tends to hold the soil in place so that good farming practices may be used to increase crop production; selected cropland can produce greater income; growing legumes will increase crop production; and wise use of all land will give greater income.

Even though soil losses are reduced to a minimum by soil-conserving measures, the job of conservation is not completed. It is essential that the soil be conserved for future generations and at the same time provide a satisfactory income for the present operators. This is possible through good land use. Good land use means protecting the soil against erosion and obtaining the maximum income from every acre on the farm. Severely eroded soil that can be terraced and retained in cultivation should be cropped to a rotation which will furnish the maximum protection against erosion and provide for increasing the productive capacity of the soil. Some areas are so badly eroded that they should be retired from cultivation. Their best use is revegetation for limited pasture or hay purposes. Creek bottoms and seepy areas too wet for cultivation in years with excessive rainfall, can best be utilized by returning to permanent pasture and stocking with cattle and sheep. Under the conditions prevailing in many parts of the area the best economic return is secured when the thin soils are utilized for the production of small grains and the more nearly level heavier soils are devoted to the cultivated crops such as cotton and corn.

APPENDIX

In order to avoid an excess of tabular material throughout the text, summary tables and tables necessary for deriving figures used in the text have been placed in this appendix as tables 7 to 20.

The data presented in this appendix will be of practical value and interest to technical readers.

TABLE 7.—*Rainfall by months, average, maximum, and minimum, 1931–41, and average, maximum, and minimum, 1913–41* [1]

Month	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	11-year record, 1931–41			29-year record, 1913–41		
												Average	Maximum	Minimum	Average	Maximum	Minimum
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
January	2.70	5.15	2.28	4.46	1.17	0.31	2.22	4.08	4.14	1.08	4.69	2.93	5.15	0.31	2.62	6.23	0.16
February	3.73	3.06	1.33	2.00	3.05	.87	.36	1.65	2.49	2.73	3.69	2.27	3.73	.36	2.23	5.29	.04
March	3.57	1.62	1.31	4.11	1.19	.19	2.99	1.55	1.83	.92	3.69	2.09	4.11	.19	2.21	6.48	T
April	2.99	2.61	.79	4.73	2.94	2.94	.68	6.22	1.54	2.50	6.21	3.10	6.22	.68	4.08	10.36	.52
May	1.54	5.06	3.80	1.34	10.15	8.01	1.31	4.37	3.30	2.44	4.15	4.13	10.15	1.31	4.47	16.01	.67
June	1.62	3.08	.08	.10	8.72	.62	1.93	3.28	3.87	8.51	6.25	3.46	8.72	.08	2.81	8.72	.08
July	1.84	.99	5.52	1.31	2.55	7.35	3.75	1.96	.96	3.09	3.80	3.01	7.35	.96	2.06	7.35	.00
August	.29	1.24	1.86	.95	1.33	.81	.64	.37	1.52	.28	2.70	1.09	2.70	.28	1.98	10.41	.07
September	.38	3.96	4.87	.69	6.95	8.21	1.63	1.28	.12	1.29	.44	2.71	8.21	.12	3.49	13.60	.12
October	.78	.14	.96	.19	2.20	4.79	2.62	.21	1.38	4.09	4.64	2.00	4.79	.14	3.07	9.15	.00
November	1.19	.49	.72	8.22	.55	1.98	5.36	1.34	2.40	8.42	1.54	2.93	8.42	.49	3.04	8.42	.19
December	3.30	3.88	2.07	1.81	5.78	4.00	5.17	1.55	.91	5.67	2.49	3.33	5.78	.91	3.05	11.13	.12
Total	23.93	31.28	25.59	29.91	46.58	40.08	28.66	27.86	24.46	41.02	44.29	33.05	------	------	35.11	------	------

[1] From records of Texas Agricultural Experiment Station, Substation No. 5, Temple, Tex.

TABLE 8.—*Average monthly temperature at Temple, Tex., for the 11-year period, 1931–41, and for the 29-year period, 1913–41* [1]

Month	Monthly average of daily temperatures			
	11-year average 1931–41	29-year average maximum	29-year average minimum	29-year average of the mean of the maximum and minimum
	°F.	*°F.*	*°F.*	*°F.*
January	49.8	60.1	36.5	48.3
February	52.7	64.6	39.9	52.2
March	59.9	71.7	46.2	59.0
April	67.2	79.3	54.3	66.8
May	74.0	85.0	62.2	73.6
June	80.6	92.1	69.5	80.8
July	83.4	95.7	71.7	83.7
August	84.1	96.3	71.4	83.9
September	79.5	90.5	66.3	78.4
October	71.4	82.1	56.3	69.2
November	57.7	69.9	45.5	57.6
December	52.2	61.8	39.0	50.4
Year	67.7	79.0	54.8	67.0

[1] The data are from the records of Texas Agricultural Experiment Substation No. 5, Temple, Tex.

TABLE 9.—*Evaporation from free water surface at Temple, Tex.* [1]

Month	11-year average evaporation 1931–41	27-year average evaporation 1915–41	Extremes of absolute daily evaporation when no rain occurred					
			Maximum during the 27-year period			Minimum during the 27-year period		
			Year	Day	Amount	Year	Day	Amount
	Inches	*Inches*			*Inch*			*Inch*
January	1.957	2.113	1938	31	0.310	1917	2	0.004
February	2.403	2.644	1927	21	.523	1920	6	.002
March	4.348	4.245	1936	23	.414	1920	10	.002
April	5.219	5.036	1934	12	.472	1923	17	.007
May	5.939	5.865	1929	2	.526	1940	29	.016
June	6.825	7.080	1926	16	.479	1926	23	.024
July	7.568	8.034	1926	1	.588	1926	14	.010
August	7.635	7.854	1929	5	.525	1939	2	.039
September	6.094	5.952	1924	1	.457	1930	30	.002
October	4.681	4.659	1927	25	.516	1936	30	.004
November	3.012	2.961	1930	10	.324	1936	1	.003
December	2.201	2.205	1940	17	.553	1918	8	.001
Year	57.882	59.648						
Extremes					.558			.001

[1] The data are from records of Texas Agricultural Experiment Substation No. 5, Temple, Tex.

TABLE 10.—*Wind movement at Temple, Tex.*[1]

Month	11-year average wind movement 1931–41	28-year average wind movement 1914–41	Extremes of wind movement: Maximum during the 28-year period — Year	Day	Movement	Minimum during the 28-year period — Year	Day	Movement	Prevailing wind direction
	Miles	*Miles*			*Miles*			*Miles*	
January	5,036	4,594	1929	5	566	1928	10	8	North.
February	5,586	4,806	1929	9	535	1923	11	15	Do.
March	6,950	5,906	1932	5	640	1925	24	13	South.
April	6,233	5,262	1936	6	563	1927	10	17	Do.
May	5,166	4,390	1929	2	562	1915	17	17	Do.
June	4,458	3,885	1928	18	436	1918	20	14	Do.
July	4,035	3,476	1939	3	390	1926	29	8	Do.
August	3,925	3,294	1915	17	482	1926	1	11	Do.
September	3,990	3,178	1939	29	450	1927	27	9	Do.
October	4,320	3,464	1926	13	563	1924	22	5	Do.
November	4,931	3,945	1929	13	530	1926	10	4	North.
December	4,941	4,328	1940	27	492	1927	24	16	Do.
Year	4,964	4,211							
Extremes					640			4	

[1] The data are from the records of Texas Agricultural Experiment Substation No. 5, Temple, Tex.

TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*

[Amounts from standard gage and intensities from recording rain gage]

Date of rain	Rainfall	Intensities: 5-min. period	15-min. period	30-min. period
1931	*Inches*	*Inches per hour*	*Inches per hour*	*Inches per hour*
Jan. 5	0.42	4.08	1.44	0.80
Jan. 10	.32	.24	.12	.08
Jan. 11	.31	.24	.12	.08
Jan. 16	.06			
Jan. 17	1.25	.48	.48	.40
Jan. 27	.20	.24	.12	.08
Jan. 28	.02			
Jan. 29	.01			
Feb. 2	.40	1.92	1.08	.68
Feb. 8	.39	.60	.52	.48
Feb. 12	.06			
Feb. 13	.59	3.48	1.72	.96
Feb. 14	.02			
Feb. 16	.75	.36	.32	.24
Feb. 22	.63	1.44	.60	.48
Feb. 23	.40	1.20	.72	.52
Feb. 27	.39	.30	.24	.20
Feb. 27	.03			
Mar. 1	.57	.96	.64	.60
Mar. 16	.79	.36	.36	.36
Mar. 20	.48	1.92	1.28	.84
Mar. 26	.20	.12	.12	.10
Mar. 27	.43	.60	.44	.26
Mar. 30	.95	.96	.48	.36
Apr. 21	.10			
Apr. 24	.48	.60	.40	.22
Apr. 28	.24	.24	.20	.16
Apr. 29	2.08	2.16	1.28	.92
Apr. 30	.06			
May 1	.79	1.68	1.16	.88
May 17–18–19	.36	.72	.36	.20
May 22	.02			
May 30	.35			
June 10	.45	.60	.44	.34
June 10	.56	4.08	2.16	1.16
June 11	.08			
1931—Con.				
June 17	0.49	0.96	0.44	0.28
June 17	.02			
June 22	.04			
June 27	.03			
June 29	.01			
July 15	1.66	3.84	2.88	2.20
July 17	.10	.48		
July 19	.06			
July 20	.04			
Aug. 3	.02			
Aug. 11	.08			
Aug. 20	.17			
Aug. 21	.01			
Sept. 10	.38	2.40	1.20	.64
Oct. 15	.18	1.44	.68	.36
Oct. 23	.59	1.20	.72	.42
Nov. 11	.04			
Nov. 14	.05			
Nov. 17	.44	.72	.72	.62
Nov. 21	.01			
Nov. 23	.16	.72	.40	.24
Nov. 24	.17	.12	.12	.12
Nov. 27	.08			
Nov. 28–30	.17			
Dec. 1	.55	.24	.20	.16
Dec. 2	.03			
Dec. 6–7	.59	.12	.12	.12
Dec. 8	.12			
Dec. 10	.05			
Dec. 11	.16	.24	.20	.16
Dec. 13	.15	.48	.32	.24
Dec. 16	.97	1.44	.56	.42
Dec. 19	.58	.48	.32	.24
Total yearly	23.44			

TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*—Con.

Date of rain	Rainfall	Intensities: 5-min. period	Intensities: 15-min. period	Intensities: 30-min. period
	Inches	*Inches per hour*	*Inches per hour*	*Inches per hour*
1932				
Jan. 4	2.41	1.20	0.48	0.36
Jan. 5	.45	1.44	.80	.64
Jan. 11	1.12	1.56	.96	.60
Jan. 12	.05	------	------	------
Jan. 15	.02	------	------	------
Jan. 16	.03	------	------	------
Jan. 17	.07	------	------	------
Jan. 22	.16	.24	.14	.12
Jan. 23	.05	------	------	------
Jan. 25	.46	.36	.20	.13
Jan. 26	.02	------	------	------
Jan. 28	.01	------	------	------
Jan. 29	.22	.24	.16	.12
Feb. 1	.03	------	------	------
Feb. 2	.03	------	------	------
Feb. 11	.53	.72	.60	.32
Feb. 13–15	.44	.36	.36	.26
Feb. 16	.18	.48	.36	.22
Feb. 18	.26	.12	.08	.08
Feb. 19	.84	.60	.44	.32
Feb. 20	.37	.72	.48	.38
Feb. 23	.28	.36	.28	.20
Mar. 1	.03	------	------	------
Mar. 2	.21	.24	.16	.16
Mar. 3	.72	.84	.48	.44
Mar. 5	.60	.36	.32	.26
Mar. 30	.01	------	------	------
Apr. 19	.02	------	------	------
Apr. 23	.76	1.44	1.00	.86
Apr. 28	1.78	3.84	2.56	1.88
Apr. 29	.06	------	------	------
May 9	.57	1.68	.64	.42
May 10	1.59	3.72	2.64	1.96
May 15	2.63	4.80	2.32	1.28
May 25	.28	1.20	1.00	.58
June 9	.74	1.20	.88	.70
June 10	1.02	4.56	2.64	1.52
June 14	.21	.24	.24	.20
June 24	.79	2.64	1.60	1.00
June 25	.21	1.80	.64	.36
June 26	.12	.84	.40	------
July 1	.08	------	------	------
July 2	.24	------	------	------
July 6	.65	4.08	2.40	1.26
July 11	.04	------	------	------
Aug. 14	.22	.12	.12	.08
Aug. 18	.04	------	------	------
Aug. 19	.01	------	------	------
Aug. 20	.61	1.44	.96	.80
Aug. 21	.40	1.68	1.12	.60
Sept. 1	.11	------	------	------
Sept. 2	.06	------	------	------
Sept. 3	2.34	1.56	.84	.44
Sept. 4	.20	------	------	------
Sept. 6	.31	.72	.36	.20
Sept. 7	.06	------	------	------
Sept. 23	.08	------	------	------
Sept. 24	.77	.48	.28	.22
Sept. 25	.16	------	------	------
Oct. 25	.07	------	------	------
Oct. 31	.07	------	------	------
Nov. 3	.02	------	------	------
Nov. 17	.02	------	------	------
Nov. 24	.44	.96	.60	.40
Dec. 5	.09	------	------	------
Dec. 9	.15	------	------	------
Dec. 11	.21	.10	.04	.03
Dec. 13	.02	------	------	------
Dec. 14	.08	------	------	------
Dec. 15	.11	------	------	------
Dec. 16	.50	.10	.10	.08
Dec. 20	.01	------	------	------
Dec. 21	.06	------	------	------
Dec. 22	.07	------	------	------
Dec. 23	1.76	3.36	2.56	2.08
Do.	.40	.55	.52	.36
1932—Con.				
Dec. 29	0.22	0.36	0.28	0.24
Dec. 30	.19	.12	.08	.06
Total yearly	31.25	------	------	------
1933				
Jan. 7	1.02	.72	.60	.44
Jan. 16	.07	------	------	------
Jan. 17	.01	------	------	------
Jan. 20	.01	------	------	------
Jan. 21	.28	1.00	.68	.42
Jan. 29	.97	.48	.36	.28
Jan. 31	.03	------	------	------
Feb. 6	.01	------	------	------
Feb. 7	.04	------	------	------
Feb. 10	.07	------	------	------
Feb. 14	.07	------	------	------
Feb. 19	.02	------	------	------
Feb. 27	1.17	.48	.40	.30
Mar. 5	.92	3.96	2.08	1.28
Mar. 24	.16	------	------	------
Mar. 30	.19	.36	.24	.20
Apr. 14	.12	------	------	------
Apr. 20	.48	2.52	1.48	.82
Apr. 24	.14	.20	.20	.16
May 3	1.00	3.12	1.80	1.22
May 24	.25	1.68	.80	.44
May 25	1.97	2.64	1.92	1.38
May 29	.60	1.92	1.40	.92
June 23	.08	------	------	------
July 12	.16	.48	.24	.14
July 29–30	5.35	4.56	3.04	1.82
Aug. 13	.18	------	------	------
Aug. 24	1.35	4.12	3.20	2.04
Aug. 31	.35	.48	.44	.40
Sept. 10	4.10	3.84	3.12	2.48
Sept. 25	.53	1.08	.56	.26
Oct. 1	.76	1.92	1.44	.84
Oct. 27	.34	.60	.40	.28
Nov. 3	.55	------	------	------
Nov. 6	.25	------	------	------
Nov. 7	.01	------	------	------
Nov. 11	.10	.12	.12	.08
Dec. 2	.33	2.04	.96	.50
Dec. 16	.10	------	------	------
Dec. 28	.16	------	------	------
Dec. 29	.55	------	------	------
Dec. 30	.83	.48	.40	.26
Total yearly	25.68	------	------	------
1934				
Jan. 3	.88	3.12	1.92	1.20
Jan. 6	.29	------	------	------
Jan. 11	.27	.12	.12	.10
Jan. 16	.40	.60	.36	.30
Jan. 17	.01	------	------	------
Jan. 18	1.17	.60	.48	.34
Jan. 19	.10	------	------	------
Jan. 26	.18	------	------	------
Jan. 27	.17	.72	.40	.22
Jan. 31	.97	.36	.36	.34
Feb. 1	.04	------	------	------
Feb. 8	.94	1.44	.60	.38
Feb. 11	.42	.48	.24	.14
Feb. 18	.28	1.92	.76	.56
Feb. 25	.10	------	------	------
Feb. 28	.23	.10	.10	.04
Mar. 1–2	1.83	2.40	1.36	1.16
Mar. 3	.02	------	------	------
Mar. 8	.06	------	------	------
Mar. 14	.10	.36	.20	.12
Mar. 18	.06	------	------	------
Mar. 25	1.98	2.16	1.08	1.06
Apr. 5	1.62	3.60	2.80	1.90

TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*—Con.

Date of rain	Rainfall	Intensities		
		5-min. period	15-min. period	30-min. period
	Inches	*Inches per hour*	*Inches per hour*	*Inches per hour*
1934—Con.				
Apr. 6	1.95	3.12	1.92	1.60
Apr. 7	.14			
Apr. 14	.05			
Apr. 19	.90			
May 2	.04			
May 10	.05			
Do	.30	1.92	1.20	
May 23	.60	3.12	1.56	1.16
May 24	.05			
May 25	.27	.72	.40	.22
June 17	.10	.12	.08	.06
July 1	.72			
July 24	.03			
July 25	.22	1.20	.52	
July 28	.28	.96	.64	.54
Aug. 4	.58	1.92	1.32	88
Aug. 26	.30	2.88	1.20	.60
Sept. 3	.05			
Sept. 11	.38	1.20	.84	.66
Sept. 14	.29	1.20	.72	.48
Oct. 14	.11	.96	.48	
Oct. 18	.05			
Nov. 2	1.90	2.40	1.28	1.16
Nov. 14–15	2.21	1.44	.80	.70
Nov. 16	.02			
Nov. 19–21	3.59	2.40	2.00	1.44
Nov. 25	.21	1.20	.60	.40
Nov. 29	.32	.24	.24	.20
Dec. 2	.11			
Dec. 7	.06			
Dec. 16–17	.62	.72	.52	.32
Dec. 25	.02			
Dec. 27	.61	.36	.32	.30
Dec. 31	.43	.24	.24	.18
Total yearly	29.68			
1935				
Jan. 7	.24	.96	.36	.20
Jan. 18	.04			
Jan. 19	.02			
Jan. 20	.84	.30	.30	.28
Feb. 7	.44	.48	.40	.32
Feb. 8	.01			
Feb. 9–11	1.96	2.64	1.92	1.32
Feb. 12–13	.60	.24	.24	.16
Feb. 25	.02			
Mar. 4	.46	1.08	.72	.56
Mar. 6	.46	1.68	1.48	.88
Mar. 9	.02			
Mar. 10	.05			
Mar. 11	.03			
Mar. 26	.06			
Mar. 30	.02			
Apr. 2	1.72	4.32	2.64	1.80
Apr. 9	.08			
Apr. 10	.02			
Apr. 19	.11			
Apr. 25	.16	.48	.28	
Apr. 26	.72	4.08	1.80	.96
Apr. 29	.08			
May 2	.66	3.00	1.44	1.04
May 3	.17	.72	.36	.28
May 4	.32	.24	.24	.16
May 5	1.41	3.36	1.92	1.48
May 10	.98	2.88	1.60	.98
May 14	1.32	5.28	3.84	2.48
May 15	1.16	4.32	2.80	1.56
May 17	.17	.72	.28	.22
May 18	2.54	6.24	3.56	2.54
May 19	.78	.96	.88	-86
May 21	.07			
May 28	.12			
1935—Con.				
May 31	0.53	2.40	1.32	
June 1–3	2.50	5.04	2.96	2.00
June 12	.28	2.40	.96	.62
June 13	.56	1.20	.64	.42
June 14	.40	.12	.12	.08
June 15	3.77	3.36	2.40	1.84
June 16	.03			
June 18	.07			
June 22	1.12	3.36	2.56	1.58
June 30	.08			
July 2	.29	1.92	1.04	.54
July 4	.20	1.44	.76	
July 13	.02			
July 19	.08			
July 23	.40	.60	.40	.32
July 24	.18	.96	.68	
July 25	.33	1.44	1.00	
July 26	.24	1.92	.96	
July 27	.55	1.92	1.40	1.06
July 28	.28	1.20	.52	
Aug. 4	.01			
Aug. 14	.01			
Aug. 21	.62	1.68	1.60	.88
Aug. 30	.66	.36	.36	.34
Sept. 3	.08			
Sept. 4	.33	.48	.32	.24
Sept. 6	1.06	3.60	1.44	.32
Sept. 7–9	3.62	2.88	1.88	1.06
Sept. 22	.03			
Sept. 24	.85	4.56	3.20	1.70
Sept. 25	.74	.60	.32	.32
Sept. 26	.24	.72	.28	
Sept. 27	.02			
Oct. 10	.11	.24	.12	.08
Oct. 18	.69	1.68	1.16	.76
Oct. 19	.05			
Oct. 23–24	1.17	.60	.44	.32
Oct. 27	.13	.36	.28	.22
Nov. 1	.03			
Nov. 3	.04			
Nov. 5	.09			
Nov. 6	.02			
Nov. 9	.01			
Nov. 15	.14	.10	.08	.06
Nov. 26	.20	.60	.28	.14
Nov. 27	.01			
Dec. 4	.09			
Dec. 5	.16	.30	.24	.14
Dec. 6	4.12	4.20	2.40	1.80
Dec. 7	.13			
Dec. 11	.27	.12	.08	.08
Dec. 12	.16	.24	.16	.12
Dec. 21	.22	.24	.16	.14
Dec. 22	.05			
Dec. 25	.06			
Dec. 28	.02			
Dec. 31	.64	.24	.20	.18
Total yearly	46.65			
1936				
Jan. 7	.20	.60	.40	.26
Jan. 8	.01			
Jan. 28	.01			
Jan. 29	.02			
Jan. 30	.05			
Feb. 1	.03			
Feb. 2	.02			
Feb. 6	.25	.12	.12	.12
Feb. 8	.01			
Feb. 16	.22	.12	.12	.10
Feb. 21	.02			
Feb. 26	.30	.48		
Mar. 2	.05			

TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*—Con.

Date of rain	Rainfall	Intensities: 5-min. period	Intensities: 15-min. period	Intensities: 30-min. period
	Inches	*Inches per hour*	*Inches per hour*	*Inches per hour*
1936—Con.				
Mar. 4	0.09	0.24		
Mar. 13–14	.02			
Mar. 26	.02			
Apr. 8	.01			
Apr. 16	.80	1.20	0.80	0.44
Apr. 17	.02			
Apr. 20	.01			
Apr. 21	.11	1.08		
Apr. 28	2.00	4.80	3.12	2.16
May 1	0.03			
May 8	1.10	3.60	2.72	1.76
May 9	.03			
May 10	1.58	4.56	3.12	2.40
May 13	.11	.96	.36	
May 18	.01			
May 22	.65	3.60	1.92	1.10
May 23	.12	.35		
May 24–26	3.94	2.40	1.56	.90
May 27	.30	.12	.12	.06
May 28	.04			
June 23	.33	1.92	1.28	
June 29	.08	.72		
June 30	.20	.36	.08	.08
July 1	1.41	1.20	.60	.28
July 4–5	4.98	7.20	5.36	4.24
July 7	.01			
July 14	.14	.36	.20	.20
July 16	.51	1.08	.64	.32
July 21	.11	.12		
July 23	.32	2.16	1.20	.64
Aug. 29	.02			
Aug. 30	.06	.12		
Aug. 31	.70	1.68	1.76	1.20
Sept. 7	.43	2.16	1.68	.84
Sept. 13–14	.43	1.20	.76	
Sept. 15	2.00	4.80	3.04	2.20
Sept. 16–17	1.13	3.36	1.88	.98
Sept. 25	.15	.96	.52	
Sept. 26–27	3.89	5.04	2.48	1.62
Oct. 7	1.48	4.80	3.12	2.20
Oct. 23–25	2.87	1.20	1.20	.96
Oct. 26–27	.07	.12		
Oct. 28–29	.36	.12	.12	.06
Oct. 31	.01			
Nov. 3	.65	.72	.52	.38
Nov. 10–11	.17	.12		
Nov. 17	.01			
Nov. 23	.68	.24	.24	.20
Nov. 28–29	.49	.24	.12	.10
Dec. 2	1.05	.36	.32	.26
Dec. 3	.01			
Dec. 5	.35	.36	.24	
Dec. 6	1.08	4.08	2.92	1.54
Dec. 9	.01			
Dec. 25	.07	.12		
Dec. 26	.16	.48	.32	.10
Dec. 27	1.18	3.60	1.64	1.00
Dec. 29	.06	.12		
Dec. 30	.01			
Total yearly	39.85			
1937				
Jan. 1	.03			
Jan. 2	.01			
Jan. 4	.02			
Jan. 5	.01			
Jan. 6	.03			
Jan. 7	.07			
Jan. 8	.52	.24	.16	.12
Jan. 10	.13			
Jan. 11	.29	.48	.32	.30
Jan. 12	.08			
Jan. 12	.14	.36	.16	.12
Jan. 12	.02			
1937—Con.				
Jan. 12	0.01			
Jan. 13	.04			
Jan. 14	.05			
Jan. 17	.08			
Jan. 19	.03			
Jan. 20	.12	0.24	0.08	0.08
Jan. 21	.05			
Jan. 22	.01			
Jan. 24	.05			
Jan. 27	.04			
Jan. 27	.01			
Jan. 27	.15	.24	.12	.08
Jan. 28	.01			
Jan. 30	.03			
Jan. 31	.01			
Feb. 1	.19	.24	.16	.10
Feb. 1	.01			
Feb. 2	.03			
Feb. 19	.07			
Feb. 27	.02			
Mar. 3	.08			
Mar. 3	.03			
Mar. 4	.10			
Mar. 4	1.58	1.44	1.32	.92
Mar. 5	.02			
Mar. 5	.16	.24	.12	.06
Mar. 6	.03			
Mar. 6	.47	.48	.36	.24
Mar. 7	.05			
Mar. 7	.02			
Mar. 7	.02			
Mar. 13	.04			
Mar. 14	.22	1.68	.08	
Mar. 14	.16	.12	.12	.12
Mar. 18	.04			
Mar. 19	.07			
Mar. 26	.06			
Mar. 29	.03			
Mar. 30	.04			
Apr. 3	.05			
Apr. 3	.02			
Apr. 20	.01			
Apr. 21	.02			
Apr. 21	.33	2.28	1.16	.60
Apr. 24	.20	1.08	.68	
May 4	.22	.36	.28	.20
May 4	.02			
May 9	.01			
May 13	.08			
May 13	.35	1.20	.72	.54
May 29	.04			
May 30	.16	.36	.24	.14
May 31	.07			
May 31	.20	.24	.20	.14
June 1	.48	.72	.40	.28
June 1	.08			
June 4	.12	.36	.24	.20
June 4	.63	.24	.24	.24
June 4	.10	.24	.16	.12
June 6	.31	1.68	1.08	.62
June 7	.41	.72	.72	.62
June 16	.01			
June 20	.03			
June 29	.01			
July 9	1.30	3.12	2.40	2.14
July 10	1.06	2.40	1.92	1.30
July 10	.05			
July 11	.06			
July 11	.93	.84	.84	.76
July 12	.01			
July 16	.03			
July 22	.07			
July 22	.13	.84	.48	
Aug. 5	.01			
Aug. 6	.41	1.68	.80	.40
Aug. 6	.03			

TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*—Con.

Date of rain	Rainfall	Intensities		
		5-min. period	15-min. period	30-min. period
1937—Con.	*Inches*	*Inches per hour*	*Inches per hour*	*Inches per hour*
Aug. 15	0.05			
Aug. 16	.01			
Aug. 20	.01			
Aug. 30	.02			
Aug. 31	1.22	2.40	1.88	1.72
Sept. 2	.11	.36	.32	.22
Sept. 7	.33	.48	.40	.32
Oct. 9	.35	.42	.28	.24
Oct. 13	1.79	.96	.88	.58
Oct. 14	.02	1.08	1.04	.92
Oct. 16	.03			
Oct. 17	.37	.36	.24	.16
Oct. 17	.10	.24	.12	.08
Oct. 18	.01			
Nov. 5	.07			
Nov. 8	.03			
Nov. 9	.05			
Nov. 9	4.63	2.76	2.32	2.12
Nov. 9	.03			
Nov. 9	.17	.24	.16	.10
Nov. 22	.08			
Nov. 22	.36	.24	.16	.10
Nov. 23	.05			
Nov. 23	.09			
Dec. 3	.05			
Dec. 4	.02			
Dec. 14	.05			
Dec. 14	.02			
Dec. 14	.06			
Dec. 14	.02			
Dec. 15	.06			
Dec. 15	.05			
Dec. 15	.02			
Dec. 15	.89	.96	.60	.42
Dec. 15	.02			
Dec. 16	.05			
Dec. 16	.12	.24	.20	.16
Dec. 16	.26	.24	.16	.12
Dec. 16	.25	.24	.12	.12
Dec. 16	.39	.24	.16	.12
Dec. 17	.22	.24	.20	.16
Dec. 21	.12	.24	.20	.14
Dec. 21	.07			
Dec. 22	.01			
Dec. 22	.04			
Dec. 22	.05			
Dec. 22	.70	.48	.44	.42
Dec. 22	.03			
Dec. 22	.61	.24	.20	.20
Dec. 23	.05			
Dec. 27	.11	.12	.12	.08
Dec. 28	.01			
Dec. 28	.09			
Dec. 28	.04			
Dec. 28	.02			
Dec. 29	.45	.48	.40	.30
Dec. 29	.04			
Total yearly	28.60			
1938				
Jan. 4	.18			
Jan. 5	.60	.12	.08	.05
Jan. 6	.07			
Jan. 9	.03			
Jan. 10	.07			
Jan. 21	.04			
Jan. 21	.27	.18		
Jan. 21	.06			
Jan. 23	2.76	2.76	2.28	1.62
Jan. 23	.03			
Jan. 29	.01			
Feb. 4	.02			

Date of rain	Rainfall	Intensities		
		5-min. period	15-min. period	30-min. period
1938—Con.	*Inches*	*Inches per hour*	*Inches per hour*	*Inches per hour*
Feb. 9	0.03			
Feb. 15	.02			
Feb. 15	.18	1.80		
Feb. 16	.47	.84	0.40	0.32
Feb. 17	.04	.24		
Feb. 17	.05	.48		
Feb. 17	.26	.48	.32	.32
Feb. 18	.06	.12		
Feb. 21	.55	.72	.48	.30
Feb. 28	.01			
Mar. 5	.02			
Mar. 8	.15	.24	.20	
Mar. 8	.07			
Mar. 9	.04			
Mar. 18	.02			
Mar. 22	.03			
Mar. 27	.02			
Mar. 27	.09			
Mar. 27	.02			
Mar. 28	.02			
Mar. 28	1.06	4.32	2.16	1.64
Mar. 31	.01			
Apr. 7	.59	.28	.28	.24
Apr. 14	.11	.72	.44	
Apr. 15	.74	2.40	1.80	1.24
Apr. 15	.13	.72	.52	
Apr. 15	.67	1.20	.96	.60
Apr. 17	.03			
Apr. 17	.13	.24	.12	
Apr. 19	.08			
Apr. 24	.56	.60	.48	.38
Apr. 24	.45	.84	.52	.34
Apr. 25	.07			
Apr. 26	.10			
Apr. 26	.16	.48	.32	
Apr. 26	.03			
Apr. 27	2.46	2.64	2.08	1.68
May 4	.36	.96	.40	.28
May 7	.71	2.40	1.44	1.18
May 7	.24	.36	.20	.16
May 10	.10	.24	.16	.10
May 12	.71	1.68	1.56	1.38
May 13	.63	.84	.80	.68
May 13	.04			
May 14	.05			
May 16	.03	.12		
May 16	.11	1.08		
May 16	.25	1.68	.52	.32
May 23	1.02	6.24	3.56	1.88
June 3	.03			
June 4	.50	.48	.28	.24
June 8	1.07	3.84	2.36	1.22
June 9	1.06	1.92	1.72	1.26
June 15	.04			
June 16	.01			
June 17	.41	1.20	1.12	.82
June 27	.02			
July 8	.02			
July 8	.03			
July 20	.39	2.88	1.44	
July 21	.23	.12	.12	.12
July 21	.04			
July 22	.19	.96	.60	
July 22	.02			
July 22	.09			
July 23	.01			
July 23	.85	.72	.40	.26
July 24	.02			
July 30	.04			
Aug. 11	.28	.84	.16	
Aug. 11	.01			
Aug. 12	.03			
Sept. 7	.15	.72	.28	.26
Sept. 11	.03			

TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*—Con.

Date of rain	Rainfall	Intensities		
		5-min. period	15-min. period	30-min. period
	Inches	*Inches per hour*	*Inches per hour*	*Inches per hour*
1938—Con.				
Sept. 11	0.02			
Sept. 11	.30	0.48		
Sept. 11	.78	2.64	2.16	
Oct. 17	.04			
Oct. 18	.15	.48		
Oct. 18	.02			
Oct. 22	.06			
Nov. 3	.20	.48	.16	
Nov. 3	.12	.24	.16	
Nov. 6	.10	.36		
Nov. 6	.53	2.52	1.24	0.86
Nov. 6	.06			
Nov. 7	.08			
Nov. 15	.04			
Nov. 15	.09			
Dec. 20	.03			
Dec. 21	.03			
Dec. 22	.02			
Dec. 22	.12			
Dec. 22	.17	.36	.32	.28
Dec. 22	.17	.60	.40	
Dec. 22	.19	.48	.48	.32
Dec. 23	.02			
Dec. 23	.05			
Dec. 25	.70			
Total yearly	27.58			
1939				
Jan. 4	.35	1.20	.92	.62
Jan. 7	.03			
Jan. 8	.03			
Jan. 8	.03			
Jan. 8	.67	1.20	.96	.76
Jan. 8	.01			
Jan. 9	.07			
Jan. 10	.12	.24	.24	.12
Jan. 11	.61	1.80	1.12	.62
Jan. 11	.04	.24	.12	
Jan. 11	.04	.24	.12	
Jan. 11	.31	.48	.40	.36
Jan. 11	.72	.72	.32	.20
Jan. 12	.01	.12		
Jan. 12	.07			
Jan. 14	.40	.60	.60	.44
Jan. 15	.16	.72	.52	
Jan. 17	.03			
Jan. 23	.04			
Jan. 23	.20	.12	.12	
Jan. 27	.03			
Feb. 2	.02			
Feb. 2	.06			
Feb. 2	.01			
Feb. 9	.12	1.20		
Feb. 17	.23	.48	.24	.20
Feb. 17	.04			
Feb. 18	.07			
Feb. 19	.11			
Feb. 19	.44	1.20		
Feb. 19	.08			
Feb. 24	.03			
Feb. 25	.13	.60	.32	
Feb. 25	.02			
Feb. 25	.91	2.16	1.40	1.04
Feb. 27	.06			
Mar. 4	.06			
Mar. 7	.06			
Mar. 25	1.05	2.88	2.24	1.76
Mar. 25	.09			
Mar. 28	.55	4.08	1.84	1.06
Apr. 5	.02			
Apr. 13	.04			
Apr. 14	.04			
Apr. 16	.80	3.60	2.48	1.44
Apr. 25	.24	.96	.84	
1939—Con.				
Apr. 26	0.10	0.48		
Apr. 26	.26	.72	0.40	
May 13	.07			
May 15	.03			
May 16	.98	3.84	2.80	1.56
May 16	.07			
May 17	1.17	3.12	1.92	1.64
May 19	.14	1.20		
May 19	.01			
May 27	.11	.48	.40	
May 28	.01			
May 29	.09			
May 30	.34	1.92	1.12	.64
May 30	.13	.48	.32	
May 31	.08			
May 31	.04			
June 3	.04			
June 3	.03			
June 3	.04			
June 4	.22	.48	.24	
June 4	.64	1.92	1.52	1.14
June 4	.02			
June 4	.30	1.20	.68	.40
June 5	.02			
June 5	.04			
June 5	.05	.48		
June 5	.92	2.28	1.88	1.34
June 5	.03	.12		
June 5	.02	.12		
June 6	.03			
June 19	1.26	2.64	2.08	1.54
June 19	.08	.84	.28	.14
June 20	.07	.60		
June 30	.04			
June 30	.03			
July 10	.05			
July 10	.06			
July 11	.02			
July 11	.14	.84	.48	
July 11	.09			
July 12	.03			
July 12	.03			
July 12	.06			
July 28	.15	.84	.52	
July 29	.12	.12	.12	
July 29	.04			
July 31	.11	.24		
Aug. 1	.08			
Aug. 1	.02			
Aug. 8	.26	1.56	.84	
Aug. 13	.02			
Aug. 15	.02			
Aug. 16	.21	.84	.64	.40
Aug. 16	.02			
Aug. 18	.63	2.88	1.80	1.16
Aug. 20	.10			
Aug. 23	.07			
Aug. 27	.06			
Sept. 11	.07			
Sept. 16	.05			
Oct. 9	.10	.24		
Oct. 10	.67	1.08	.76	.48
Oct. 12	.01			
Oct. 24	.04			
Oct. 25	.54	.36	.32	
Oct. 27	.05			
Nov. 10	.04			
Nov. 10	.04			
Nov. 10	.16	.24	.12	
Nov. 11	.01			
Nov. 11	.34	.36	.32	.28
Nov. 11	.67	.48	.36	.32
Nov. 11	.15	.24	.16	
Nov. 14	.04			
Nov. 15	.06			
Nov. 17	.02			

TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*—Con

Date of rain	Rainfall	Intensities		
		5-min. period	15-min. period	30-min. period
	Inches	*Inches per hour*	*Inches per hour*	*Inches per hour*
1939—Con.				
Nov. 18	0.03			
Nov. 18	.04			
Nov. 29	.20	0.12	0.12	0.12
Nov. 29	.04			
Nov. 30	.23	.24	.16	.12
Nov. 30	.17	.24		
Dec. 22	.42	.36	.16	
Dec. 22	.08			
Dec. 22	.08			
Dec. 25	.14			
Dec. 25	.02			
Dec. 25	.05			
Dec. 25	.07			
Dec. 28	.01			
Total yearly	23.77			
1940				
Jan. 4	.23	.48	.44	.32
Jan. 4	.01			
Jan. 6	.56	.36	.32	.28
Jan. 22 [1]	.13			
Feb. 1	.04			
Feb. 2	.08			
Feb. 2	.01			
Feb. 3	.37	.72	.48	.32
Feb. 3	.65	.60	.48	.36
Feb. 3	.11	.24	.16	.10
Feb. 3	.08			
Feb. 3	.02			
Feb. 5	.10	.24	.12	.10
Feb. 9 [1]	.23			
Feb. 16	.81	1.08	.88	.60
Mar. 11	.02			
Mar. 20	.27			
Mar. 25	.01			
Mar. 26	.11	.60	.32	.20
Mar. 27	.31	.60	.32	.20
Mar. 29	.16	.24	.16	.12
Apr. 5	.25			
Apr. 6	.63	1.56	.80	.44
Apr. 6	.90	2.28	1.44	.96
Apr. 11	.25	1.44	.72	.38
Apr. 17	.04			
Apr. 17	.03			
Apr. 24	.06			
Apr. 24	.04			
Apr. 24	.04			
Apr. 24	.05			
Apr. 24	.02			
Apr. 28	.02			
Apr. 28	.02			
Apr. 28	.01			
Apr. 28	.03			
Apr. 30	.03			
May 14	.09			
May 18	.05			
May 18	.17	.24	.24	.22
May 22	.96	1.68	1.60	1.04
May 22	.15			
May 23	.69	2.40	1.96	1.30
May 23	.01			
May 27	.02			
May 27	.12	.60	.4	.24
May 27	.08			
May 31	.13	1.56		
June 9	.02			
June 10	.32	.60	.48	.28
June 10	.15	.48	.24	.14
June 12	.82	2.88	2.00	1.08
June 13	.04			
June 15	.24	1.80	.84	.46
June 15	.13	.48	.36	.20

Date of rain	Rainfall	Intensities		
		5-min. period	15-min. period	30-min. period
	Inches	*Inches per hour*	*Inches per hour*	*Inches per hour*
1940—Con.				
June 17	0.02			
June 17	.07			
June 17	.02			
June 17	.04			
June 18	.07			
June 18	1.17	3.60	2.56	1.80
June 18	.01			
June 18	.14			
June 19	.03			
June 19	.09			
June 24	1.29	1.56	1.08	.78
June 28	1.60	2.40	1.20	1.02
June 29	.63	.36	.28	.18
June 29	.56	.96	.52	.38
June 29	.13			
June 30	.09			
June 30	.52	1.08	.56	.30
June 30	.09			
July 2	.61	1.92	1.76	1.22
July 3	.19	1.20	.40	.20
July 3	.04			
July 12	1.87	3.60	3.28	2.88
July 13	.04			
July 15	.13	.48	.40	.24
Aug. 17	.10	.84	.32	.16
Aug. 18	.02			
Aug. 18	.06			
Aug. 27	.01			
Aug. 29	.08			
Sept. 11	.05			
Sept. 21–22	.49	.72	.60	.34
Sept. 24	.95	5.30	2.80	1.40
Oct. 6–7	.09			
Oct. 14	.25	.72	.48	.40
Oct. 25	.01			
Oct. 26–27	.74	2.28	1.04	.56
Oct. 28	1.05	4.20	2.28	1.24
Oct. 31	1.98	3.00	2.04	1.72
Nov. 4–5	.10			
Nov. 7–9	1.12	.96	.56	.48
Nov. 21	.22	.24	.12	.08
Nov. 22–25	6.67	2.76	1.52	1.20
Dec. 11	3.11	2.04	1.60	1.24
Dec. 12	.42	.48	.32	.24
Dec. 14–15	1.32	.48	.32	.28
Dec. 24–26	.61	.48	.16	.12
Dec. 30–31	.05			
Total yearly	39.87			
1941				
Jan. 2	.02			
Jan. 6	.14	.12	.06	.05
Jan. 13	4.42	4.32	2.80	1.68
Jan. 23	.06			
Jan. 25	.01			
Jan. 31	1.51	.48	.36	.26
Feb. 1				
Feb. 1	.34	.24	.24	.18
Feb. 5–6	.14			
Feb. 19	.20	.36	.20	.18
Feb. 22	.13	.36		
Feb. 22–23	1.29	1.44	.72	.44
Mar. 5–6	1.48	2.04	1.60	1.04
Mar. 6	.01			
Mar. 17–18	1.57	.36	.24	.22
Mar. 20	.04			
Mar. 23	.09			
Mar. 26	.32	.24	.16	.16
Apr. 2	.95	5.28	3.28	1.88
Apr. 6	.63	2.16	1.84	1.08
Apr. 12	.01			
Apr. 16	.07			

See footnote at end of table.

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TABLE 11.—*Rainfall record for control plots Jan. 1, 1931, to Dec. 31, 1941*—Con.

Date of rain	Rainfall	Intensities			Date of rain	Rainfall	Intensities		
		5-min. period	15-min. period	30-min. period			5-min. period	15-min. period	30-min. period
1941—Con.	*Inches*	*Inches per hour*	*Inches per hour*	*Inches per hour*	*1941*—Con.	*Inches*	*Inches per hour*	*Inches per hour*	*Inches per hour*
Apr. 19	0.40	1.20	0.92	0.60	Aug. 6–7	2.22	6.60	4.92	3.40
Apr. 21–23	1.41	2.64	1.68	1.64	Aug. 7	.03			
Apr. 23–24	.92	3.12	1.20	.68	Aug. 13	.06			
Apr. 26	.64	.24	.20	.20	Aug. 23	.05			
Apr. 27	.30	.60	.40	.32	Sept. 9	.03			
Apr. 28	.55	1.20	1.04	.74	Sept. 16	.29	.96	.60	
Apr. 29	.03				Sept. 22	.01			
May 2	.88	1.56	.92	.78	Sept. 23	.09	.72		
May 5	.72	3.36	2.48		Oct. 1	.02			
May 11	1.05	5.52	3.84	2.10	Oct. 3	.17	.36	.16	.12
May 19	.24	.36	.20	.18	Oct. 4	.76	1.44	.88	.54
May 21	1.13	2.16	1.36	1.04	Oct. 5	.15	.84	.48	
May 27	.04				Oct. 6	.17	.48		
May 28	.09				Oct. 6–7	.10			
May 29	.02				Oct. 7	.18	2.16		
May 30–31	.02				Oct. 8	.13	.84		
June 2–3	1.40	5.76	3.44	2.16	Oct. 10	.23	.24	.24	.22
June 3	.94	3.00	1.64	1.34	Oct. 19	.10	.24		
June 6	.42	.84	.44	.26	Oct. 23	2.32	3.24	2.40	1.76
June 7–8	.19	.84			Oct. 29	.15			
June 9–10	1.65	3.12	2.44	1.76	Oct. 30	.09			
June 15–16	1.31	4.32	3.28	1.80	Nov. 19	.62	3.48	1.84	.98
June 22	.02				Nov. 20	.07			
June 23	.01				Nov. 21–22	.82	.96	.56	.46
June 26–27	.55	1.08	.76	.60	Dec. 10–11	1.20	.48	.40	.26
July 3	.30	.24	.16	.16	Dec. 12	.06			
July 10	.10	.12	.12		Dec. 20–22	1.14	1.44	1.20	.92
July 11	2.92	3.12	2.00	1.40	Dec. 25	.11			
July 11	.08				Dec. 31	T			
July 14	.31	1.20	.52	.38					
Aug. 4	.31	2.88			Total yearly	43.75			

[1] Melted snow.

TABLE 12.—*Data for all individual storms causing runoff from control plots 1, 2, and 3, Jan. 1, 1931, to Dec. 31, 1941*

[Land slope 4.0 percent; crop continuous corn; rows down slope; soil Austin clay, formerly classified Houston black clay]

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss					
						Plot 1 [1]		Plot 2 [2]		Plot 3 [3]	
		5-min. period	15-min. period	30-min. period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1931	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*	*In.*	*Tons*
Jan. 5	0.42	4.08	1.44	0.80	Open; bedded for corn	0.007	0.08	0.001	0.02	0.002	0.065
Feb. 13	.59	3.48	1.72	.96	do	.002	.02	.001	.005	.010	.04
Feb. 22	.63	1.44	.60	.48	do	.001	.005	.001	.005	.011	.04
Feb. 23	.40	1.20	.72	.52	do	.091	.13	.046	.08	.074	.19
Mar. 30	.95	.96	.48	.36	Corn	.001	.007	T	.002	.002	.016
Apr. 29	2.08	2.16	1.28	.92	do	.167	1.77	.154	.18	.248	.38
May 1	.79	1.68	1.16	.88	do	.409	2.79	.487	1.22	.571	1.59
June 10	.56	4.08	2.16	1.10	do	.002	.015	.008	.018	----	----
July 15	1.66	3.84	2.88	2.20	do	.009	.017	.010	.017	.022	.049
Dec. 16	.97	1.44	.56	.42	Open; spaded	.027	.073	.008	.02	.033	.074
Dec. 19	.58	.48	.32	.24	do	.018	.004	.004	.001	.020	.007
Total, yearly	9.63	----	----	----		.734	4.911	.720	1.568	.993	2.451
1932											
Jan. 4	2.41	1.20	.48	.36	Open; bedded for corn	.181	.09	.089	.20	.191	.128
Jan. 5	.45	1.44	.80	.64	do	.191	.32	.115	.30	.142	.17
Jan. 11	1.12	1.56	.96	.60	do	.241	.466	.177	.45	.240	.521
Feb. 11	.53	.72	.60	.32	do	.008	.034	.002	.012	.004	.021
Feb. 20	.37	.72	.48	.38	do	.025	.048	.025	.013	.039	.087
Apr. 28	1.78	3.84	2.56	1.88	Corn	.442	2.15	.264	1.69	.298	1.635
May 10	1.59	3.72	2.64	1.96	do	.532	2.45	.370	1.90	.368	1.89
May 15	2.63	4.80	2.32	1.28	do	1.553	9.71	1.485	11.40	1.446	9.46
June 10	1.02	4.56	2.64	1.52	do	.089	.39	.174	1.26	.209	1.845
June 24	.79	2.64	1.60	1.00	do	.028	.63	.121	.87	.114	.63
June 25	.21	1.80	.64	.36	do	.38	.19	.036	.18	.035	.13
July 6	.65	4.08	2.40	1.26	do	.102	.52	.095	.90	.060	.725
Aug. 20	.61	1.44	.96	.80	do	.051	.12	.029	.066	----	----
Sept. 3	2.34	1.56	.84	.44	do	.050	.06	.069	.045	.037	.085
Dec. 23	1.76	3.36	2.56	2.08	Open; spaded	.547	2.60	.242	1.20	.297	1.63
Total, yearly	18.26	----	----	----		4.078	19.778	3.293	20.576	3.480	18.957

See footnotes at end of table.

TABLE 12.—*Data for all individual storms causing runoff from control plots 1, 2, and 3, Jan. 1, 1931, to Dec. 31, 1941*—Continued

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss					
						Plot 1		Plot 2		Plot 3	
		5-min. period	15-min. period	30-min. period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1933	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*	*In.*	*Tons*
Mar. 5	0.92	3.96	2.08	1.28	Open; bedded for corn	0.414	2.87	0.282	1.92	0.300	2.97
May 3	1.00	3.12	1.80	1.22	Corn	.175	1.92	.109	.63	.185	1.42
May 25	1.97	2.64	1.92	1.38	do	.254	.86	.085	.498	.149	.59
May 29	.60	1.92	1.40	.92	do	.094	.40	.046	.24	.068	.45
July 29–30	5.35	4.56	3.04	1.82	do	1.385	2.58	.832	2.13	1.294	2.08
Aug. 24	1.35	4.12	3.20	2.04	do	.432	2.73	.260	1.56	.273	1.31
Sept. 10	4.10	3.84	3.12	2.48	Open; spaded	2.733	8.53	1.973	4.87	2.555	5.91
Total, yearly	15.29					5.487	19.89	3.587	11.848	4.824	14.73
1934											
Jan. 3	.88	3.12	1.92	1.20	Open; bedded for corn	.150	.552	.101	.37	.174	.74
Feb. 8	.94	1.44	.60	.38	do	.116	.152	.034	.09	.101	.18
Feb. 11	.42	.48	.24	.14	do	.057	.163	.034	.024	.064	.042
Feb. 18	.28	1.92	.76	.56	do	.053	.496	.041	.20	.042	.28
Mar. 1–2	1.83	2.40	1.36	1.16	do	.552	1.68	.384	1.47	.487	2.31
Mar. 25	1.98	2.16	1.08	1.06	Corn	.233	.46	.104	.33	.080	.21
Apr. 5	1.62	3.60	2.80	1.90	do	.602	4.29	.425	3.04	.471	3.80
Apr. 6	1.95	3.12	1.92	1.60	do	1.515	6.32	1.288	7.75	1.382	6.04
Aug. 26	.30	2.88	1.20	.60	do	.040	.604			.009	.021
Sept. 11	.38	1.20	.84	.66	do	.024	.136				
Sept. 14	.29	1.20	.72	.48	do	.018	.569			.010	.136
Nov. 14–15	2.21	1.44	.80	.70	Open; spaded	.577	.217	.161	.064	.162	.491
Nov. 19–21	3.59	2.40	2.00	1.44	do	1.453	17.86	1.983	13.98	1.854	24.75
Nov. 29	.32	.24	.24	.20	do	.020	.306			.008	.174
Total, yearly	16.99					5.410	33.805	4.555	27.318	4.844	39.174
1935											
Feb. 9–11	1.96	2.64	1.92	1.32	Open; bedded for corn	.598	.581	.227	.189	.160	1.138
Feb. 12–13	.60	.24	.24	.16	do	.043	.017	.018	.019	.030	.023
Mar. 6	.46	1.68	1.48	.88	Corn	.022	.495	.004	.008	.007	.122
Apr. 2	1.72	4.32	2.64	1.80	do	.854	9.801	.795	5.504	.735	5.997
Apr. 26	.72	4.08	1.80	.96	do	.023	.170	.001	.005	.002	.010
May 2	.66	3.00	1.44	1.04	do	.051	.583	.003	.010	.009	.116
May 4	.32	.24	.24	.16	do	.039	.599	.003	.003	.006	.008

May 5	1.41	3.36	1.92	1.48	do	.572	1.847	.545	1.046	.520	1.206
May 10	.98	2.88	1.60	.98	do	.124	1.101	.051	.106	.076	.198
May 14	1.32	5.28	3.84	2.48	do	.777	6.113	.709	3.694	.599	3.125
May 15	1.16	4.32	2.80	1.56	do	.672	4.102	.711	3.280	.629	2.978
May 17	.17	.72	.28	.22	do	.026	.279	.009	.030	.014	.073
May 18	2.54	6.24	3.56	2.54	do	1.889	7.488	1.840	9.136	1.993	6.311
May 19	.78	.96	.88	.86	do	.284	1.445	.341	1.590	.339	1.742
June 1–3	2.50	5.04	2.96	2.00	do	.679	2.295	.464	1.082	.434	1.271
June 15	3.77	3.36	2.40	1.84	do	1.896	5.108	.916	3.544	1.217	2.552
June 22	1.12	3.36	2.56	1.58	do	.274	1.281	.323	1.134	.349	1.030
July 27–28	.83	1.92	1.40	1.06	do	.119	.181	.023	.028	.039	.063
Sept. 7–9	3.62	2.88	1.88	1.06	do	.123	.077	.062	.286	.182	.248
Dec. 6	4.12	4.20	2.40	1.80	Open; spaded	.155	.140			.021	.012
Soil in top water							.948		.735		.917
Total yearly	30.76					9.220	44.651	7.045	31.427	7.361	29.140
1936											
Apr. 28	2.00	4.80	3.12	2.16	Corn, 12 inches; loose, moist	.420	3.472	.443	2.618	.459	2.885
May 8	1.10	3.60	2.72	1.76	Corn, 14 inches; moist, plowed May 8	.164	1.479	.225	.902	.178	1.424
May 10	1.58	4.56	3.12	2.40	Corn, 14 inches; moist, plowed May 8	1.138	6.576	1.135	7.035	.944	6.723
May 22	.65	3.60	1.92	1.10	Corn, 2 feet; moist, plowed May 19	.078	.366	.048	.231	.061	.287
May 24–26, 27–28	4.28	2.40	1.56	.90	Corn, 2 feet 6 inches; wet, saturated	1.158	1.044	1.340	1.619	1.087	1.398
July 4–5	4.98	7.20	5.36	4.24	Corn, 5 feet 6 inches; wet, packed	3.248	20.223	3.920	23.041	3.294	22.897
July 23	.32	2.16	1.20	.64	Corn, 5 feet 6 inches; topsoil, wet; loose	.043	.238	.018	.112	.014	.123
Sept. 15	2.00	4.80	3.04	2.20	Open, loose spaded; moist	.053	.114	.018	.007	.017	.078
Sept. 16–17	1.13	3.36	1.88	.98	Open, loose spaded; saturated	.062	.046	.013	.015	.017	.030
Sept. 26–27	3.89	5.04	2.48	1.62	Open, loose spaded; saturated	.274	1.016	.063	.227	.080	.182
Oct. 7	1.48	4.80	3.12	2.20	Open, spaded; wet	.238	2.078	.035	.767	.072	1.206
Oct. 23–25	2.87	1.20	1.20	.96	Open, spaded; saturated	.159	.096	.020	.012	.062	.024
Nov. 3	.65	.72	.52	.38	Open, spaded; moist	.062	.041	.010	.006	.033	.012
Dec. 6	1.08	4.08	2.92	1.54	Open, spaded; wet	.326	1.742	.192	.513	.139	.704
Soil in top water							.807		.542		.591
Total yearly	28.01					7.423	39.338	7.480	37.647	6.457	38.564
1937											
Mar. 4	1.68	1.44	1.32	.92	Corn planted Mar. 1; loose, moist	.090	.848	.008	.004	.117	.774
Mar. 6	.50	.48	.36	.24	Corn planted Mar. 1; packed, wet	.035	.015			.024	.004
June 6–7	.72	1.68	1.08	.62	Corn, 4 feet 6 inches; wet	.072	.204	.051	.183	.067	.119
July 9–11	3.40	3.12	2.40	2.14	Corn, 6 feet; packed, wet	.526	2.508	.539	2.618	.488	2.100
Aug. 31	1.22	2.40	1.88	1.72	Cornstalks; cracked, open, dry	.101	.068	.115	.147	.171	.512
Nov. 9	4.88	2.76	2.32	2.12	Open spaded; packed, moist	.466	.745	.030	.056	.206	.588
Soil in top water							.052		.110		.058
Total yearly	12.40					1.290	4.440	.743	3.118	1.073	4.155
1938											
Jan. 23	2.79	2.76	2.28	1.62	Open; bedded for corn; moist, slightly packed	.093	.066	.004	.007	.024	.028
Mar. 28	1.08	4.32	2.16	1.64	Corn, 7 inches; moist, flat surface	.180	.954	.062	.348	.113	.871
Apr. 14–15	1.65	2.40	1.80	1.24	Corn, 10 inches; wet, slightly packed	.192	.337	.076	.184	.116	.351
Apr. 27	2.46	2.64	2.08	1.68	Corn up about 18 inches; wet, slightly packed	.856	1.367	.615	1.595	.809	2.098
May 12–13	1.38	1.68	1.56	1.38	Corn, 2 feet 6 inches; wet, slightly packed	.287	.527	.228	.709	.202	.722

See footnotes at end of table.

TABLE 12.—*Data for all individual storms causing runoff from control plots, 1, 2, and 3, Jan. 1, 1931, to Dec. 31, 1941*—Continued

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss					
						Plot 1		Plot 2		Plot 3	
		5-min. period	15-min. period	30-min. period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1938—Con.	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*	*In.*	*Tons*
May 16	0.39	1.68	0.52	0.32	Corn, 2 feet 9 inches; moist, slightly packed	0.036	0.137	0.018	0.059	0.029	0.131
May 23	1.02	6.24	3.56	1.88	Corn, 3 feet; moist, slightly packed	.463	3.369	.384	4.325	.442	4.857
June 8–9	2.13	3.84	2.36	1.26	Corn, 5 feet; moist, slightly packed	.528	.702	.536	2.191	.591	3.557
Total yearly	12.90					2.635	7.459	1.923	9.418	2.326	12.615
1939											
Jan. 10–12	1.85	1.80	1.12	.62	Open; bedded for corn; wet, loose	.396	.250	.034	.027	.139	.159
Jan. 14–15	.56	.60	.60	.44	Open; bedded for corn; wet, slightly packed	.158	.061	.048	.041	.121	.087
Feb. 25	1.06	2.16	1.40	1.04	Open; bedded for corn; moist, slightly packed	.110	.165	.027	.110	.089	.322
Mar. 25	1.05	2.88	2.24	1.76	Corn, 2 inches; dry, loose, flat condition	.250	1.277	.089	.465	.216	2.115
Mar. 28	.55	4.08	1.84	1.06	Corn, 3 inches; moist, slightly packed; crusted	.239	1.879	.140	.827	.199	1.583
Apr. 16	.80	3.60	2.48	1.44	Corn, 8 inches; moist, slightly packed; crusted	.269	2.554	.213	1.154	.313	2.724
May 16	.98	3.84	2.80	1.56	Corn, 2 feet; dry, loose	.177	1.356	.100	.639	.215	2.229
May 17	1.17	3.12	1.92	1.64	Corn, 2 feet; wet, slightly packed	.787	2.812	.609	2.40	.822	3.496
June 4	.64	1.92	1.52	1.14	Corn, 5 feet; wet, loose	.031	.029			.043	.139
June 5	1.02	2.28	1.88	1.34	Corn, 5 feet; wet, slightly packed	.373	.435	.189	.265	.342	.512
June 19	1.34	2.64	2.08	1.54	Corn, 6 feet; moist, slightly packed	.119	.219	.095	.321	.198	.776
June 20	.07	.60			Corn, 6 feet; wet, slightly packed	.019	.048	.012	.029	.019	.047
Total yearly	11.09					2.928	11.085	1.556	6.278	2.716	14.189
1940											
Apr. 5–6	1.78	2.28	1.44	.96	Corn, 4 inches; moist, slightly packed	.205	.212	.219	.393	.323	.782
May 22–23	.85	2.40	1.96	1.30	Corn, 2 feet 6 inches; wet, slightly packed	.198	.148	.139	.154	.236	.301
June 12	.82	2.88	2.00	1.08	Corn, 4 feet; moist, slightly packed, crusted	.051	.107	.066	.200	.066	.206
June 18	1.32	3.60	2.56	1.80	Corn, 4 feet; wet, slightly packed	.499	.738	.471	1.383	.430	1.312
June 24	1.29	1.56	1.08	.78	Corn, 4 feet 6 inches; wet, slightly packed	.328	.472	.299	.646	.236	.388
June 28–30	3.62	2.40	1.20	1.02	do	1.056	.884	.838	1.069	.809	1.122
July 2	.61	1.92	1.76	1.22	do	.269	.618	.241	1.034	.203	.809
July 3	.23	1.20	.40	.20	do	.037	.075	.025	.062	.028	.086
July 12	1.87	3.60	3.28	2.88	Corn, 4 feet 6 inches; moist, loose	.579	2.347	.686	4.061	.616	2.855
Oct. 28	1.05	4.20	2.28	1.24	Open; spaded; wet, loose	.041	.269	.006	.052	.010	.077
Oct. 31	1.98	3.00	2.04	1.72	Open; spaded; wet, slightly packed	.203	.424	.008	.025	.013	.043
Nov. 22–25	6.67	2.76	1.52	1.20	Open; bedded for corn; moist, loose	1.535	.988	1.786	2.462	1.504	2.620

Dec. 11	3.11	2.04	1.60	1.24	Open; bedded for corn; wet, slightly packed	1.381	.119	1.277	2.334	1.185	2.515
Dec. 12	.42	.48	.32	.24	do	.164	.119	.155	.198	.152	.155
Dec. 14-15	1.32	.48	.32	.28	do	.804	.292	.700	.561	.760	.429
Total yearly	26.94					7.350	10.79	6.916	14.634	6.571	13.700
1941											
Jan. 13	4.42	4.32	2.80	1.68	Bedded; wet, packed	2.396	10.71	2.390	17.03	2.328	14.36
Feb. 22-23	1.29	1.44	.72	.44	do	.212	.12	.060	.02	.132	.12
Mar. 5-6	1.48	2.04	1.60	1.04	Bedded; wet, crusted	.357	.29	.223	.64	.275	.26
Apr. 2	.95	5.28	3.28	1.88	Corn, 1-3 inches; moist, crusted, flat condition	.281	1.51	.136	.62	.141	.59
Apr. 6	.63	2.16	1.84	1.08	Corn, 4 inches; moist, crusted, flat condition	.161	.56	.087	.23	.126	.33
Apr. 21-23	1.41	2.64	1.68	1.64	Corn, 4-7 inches; moist and packed	.825	2.03	.607	1.69	.636	1.63
Apr. 23-24	.92	3.12	1.20	.68							
Apr. 27	.30	.60	.40	.32	Corn, 4-7 inches; very wet and packed	.069	.04	.018	.02	.035	.04
Apr. 28	.55	1.20	1.04	.74	Corn, 5-7 inches high; very wet and packed	.174	.16	.130	.15	.115	.12
May 2	.88	1.56	.92	.78	Corn, 5-9 inches; very wet and packed	.111	.07	.058	.05	.070	.05
May 5	.72	3.36	2.48		Corn, 8-12 inches; very wet and packed	.377	1.55	.280	1.12	.219	.90
May 11	1.05	5.52	3.84	2.10	Corn, 10-14 inches; loose, recently plowed	.477	3.54	.378	2.67	.201	1.68
May 21	1.13	2.16	1.36	1.04	Corn, 12-20 inches; loose and moist	.057	.10	.041	.05	.108	.20
June 2, 3	1.40	5.76	3.44	2.16	Corn, 28-40 inches; top soil dry; subsoil moist	.369	2.51	.336	1.05	.390	1.64
June 3	.94	3.00	1.64	1.34	Corn, 28-40 inches; wet and packed	.447	1.43	.341	1.17	.413	2.00
June 9-10	1.65	3.12	2.44	1.76	Corn, 2½-5 feet; wet and packed	.651	1.89	.556	1.20	.465	1.14
June 15-16	1.31	4.32	3.28	1.80	Corn, 2½-5 feet; crusted and packed	.674	2.38	.596	2.65	.601	2.13
July 11	2.92	3.12	2.00	1.40	Corn, 3-5 feet; loose, freshly plowed	1.064	1.38	.948	2.47	.884	1.58
Aug. 6-7	2.22	6.60	4.92	3.40	Corn drying up; topsoil moist, subsoil dry	1.276	3.46	1.122	10.65	1.144	9.81
Oct. 4	.76	1.44	.88	.54	Corn stubble; topsoil moist, subsoil dry	.022	.04	.007	.01	.005	.02
Oct. 7	.18	2.16			Corn stubble; wet and packed	.049	.09	.031	.07	.064	.14
Oct. 23	2.32	3.24	2.40	1.76	No crop; moist and flat broken	.20	.06			.009	.01
Total yearly	29.43					10.069	33.92	8.345	43.56	8.361	38.75

[1] Plot size, 6 by 36.3 feet.
[2] Plot size, 6 by 145.2 feet.
[3] Plot size, 6 by 72.6 feet.

TABLE 13.—*Individual storm data for storms causing runoff from control plots 4 and 5 for the 11-year period Jan. 1, 1931 to Dec. 31, 1941*

[Plot size 1/100 acre, 6 feet by 72.6 feet, land slope 4 percent, crop rotation: corn, oats, cotton; soil Austin clay, formerly classified as Houston black clay]

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss			
						Plot 4 [1]		Plot 5 [2]	
		5-min. period	15-min. period	30-min. period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1931	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*
Jan. 5	0.42	4.08	1.44	0.80	Open, bedded for corn	0.002	0.05	0.002	0.07
Feb. 22	.63	1.44	.60	.48	do	.001	.005	.008	.02
Feb. 23	.40	1.20	.72	.52	do	.068	.08	.008	.03
Mar. 30	.95	.96	.48	.36	Corn	.001	.005	.074	.28
Apr. 29	2.08	2.16	1.28	.92	do	.125	.126	.001	.006
May 1	.79	1.68	1.16	.88	do	.334	.523	.125	.23
July 15	1.66	3.84	2.88	2.20	do	.003	.002	.004	.02
Dec. 16	.97	1.44	.56	.42	Oats	.002	.026	.005	.002
Dec. 19	.58	.48	.32	.24	do	.001	.003	.004	.002
Total yearly	8.48					.537	.820	.231	.660
1932									
Jan. 4	2.41	1.20	.48	.36	Oats	.001	.003	.007	.006
Jan. 5	.45	1.44	.80	.64	do	.011	.025	.020	.05
Jan. 11	1.12	1.56	.96	.60	do	.015	.014	.022	.026
Dec. 23					Open, spaded			.147	.37
Total yearly	3.98					.027	.042	.196	.452
1933									
Mar. 5	.92	3.96	2.08	1.28	Open, bedded for cotton	.111	.46	.162	1.25
May 3	1.00	3.12	1.80	1.22	Cotton	.167	.87	.183	1.30
May 25	1.97	2.64	1.92	1.38	do	.208	.64	.078	.085
May 29	.60	1.92	1.40	.92	do	.075	.033	.053	.063
July 29–30	5.35	4.56	3.04	1.82	do	.471	.63	.058	.05
Sept. 10	4.10	3.84	3.12	2.48	do	1.387	2.27	.363	.53
Total yearly	13.94					2.419	5.91	.877	3.278
1934									
Jan. 3	.88	3.12	1.92	1.20	Open, bedded for corn	.018	.076		
Feb. 8	.94	1.44	.60	.38	do	.012	.013		
Feb. 11	.42	.48	.24	.14	do	.008	.017		
Feb. 18	.28	1.92	.76	.56	do	.016	.11		
Mar. 1–2	1.83	2.40	1.36	1.16	do	.407	.94		
Mar. 25	1.98	2.16	1.08	1.06	Corn	.018	.045	.038	.12
Apr. 5	1.62	3.60	2.80	1.90	do	.417	3.64	.378	2.88
Apr. 6	1.95	3.12	1.92	1.60	do	1.332	6.36	1.004	5.25
Nov. 14–15	2.21	1.44	.80	.70	Oats	.187	.557	.183	.127
Nov. 19–21	3.59	2.40	2.00	1.44	do	1.424	10.830	1.868	5.30
Nov. 29	.32	.24	.24	.20	do	.013	.039		
Total yearly	16.02					3.852	22.627	3.471	13.677
1935									
Feb. 9–11	1.96	2.64	1.92	1.32	Oats killed by freeze 1-21-35; replanted 2-5-35.	.005	.029	.008	.026
Mar. 6	.46	1.68	1.48	.88	Oats	.009	.118	.010	.053
Apr. 2	1.72	4.32	2.64	1.80	do	.057	.191	.186	.151
June 15	3.77	3.36	2.40	1.84	do	.022	.014	.409	.098
June 22					do			.077	.078
July 27–28					Oat stubble			.020	.013
Dec. 6					Open, spaded			.185	.344
Soil in top water							.002		.399
Total yearly	7.91					.093	.354	.895	.802

See footnotes at end of table.

TABLE 13.—*Individual storm data for storms causing runoff from control plots 4 and 5 for the 11-year period Jan. 1, 1931 to Dec. 31, 1941*—Continued

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss			
						Plot 4		Plot 5	
		5-min. period	15-min. period	30-min. period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1936	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*
Apr. 28	2.00	4.80	3.12	2.16	Open; loose; moist	0.527	3.424	0.678	2.933
May 8	1.10	3.60	2.72	1.76	Cotton; 2 inches moist; cotton plowed May 7.	.130	1.439	.097	.357
May 10	1.58	4.56	3.12	2.40	do	.893	10.658	.562	5.145
May 22	.65	3.60	1.92	1.10	Cotton; moist; cotton plowed May 18.	.069	.322		
May 24-26-27-28.	4.28	2.40	1.56	.90	Cotton; 10 to 12 inches; wet; plowed May 18.	1.128	2.114	.070	.146
July 4-5	4.98	7.20	5.36	4.24	Cotton; 3 feet; moist	3.087	26.352	2.229	4.639
Sept. 15	2.00	4.80	3.04	2.20	Cotton stalks; moist; cotton picked fourth time.	.193	.204		
Sept. 16-17	1.13	3.36	1.88	.98	Cotton stalks; wet; cotton picked.	.375	3.475	.044	.030
Sept. 26-27	3.89	5.04	2.48	1.62	Drilled to vetch; wet	1.009	3.434	.454	.568
Oct. 7	1.48	4.80	2.12	2.30	Vetch; 1 inch; wet	.399	1.894	.310	1.500
Oct. 23-25	2.87	1.20	1.20	.96	Vetch; 2 inches; wet	.013	.003		
Dec. 6	1.08	4.08	2.92	1.54	Vetch; 6 inches; wet	.050	.915	.026	.104
Dec. 27	1.18	3.60	1.64	1.00	do	.012	.026		
Soil in top water							.681		.318
Total yearly	28.22					7.885	54.941	4.470	15.740
1937									
Mar. 4					Corn, planted; loose; moist.			.010	.008
June 6-7	.72	1.68	1.08	.62	Corn, 4 feet 6 inches; crusted.	.018	.022		
July 9-11	3.40	3.12	2.40	2.14	Corn, 6 feet; packed, wet.	.296	.917	.089	.099
Aug. 31	1.22	2.40	1.88	1.72	Cornstalks, cracked open; dry.	.091	.076		
Nov. 9	4.88	2.76	2.32	2.12	Oats, 1 inch; loose; dry	1.533	4.438	.750	2.104
Dec. 21-22	1.63	.48	.44	.42	Oats, 3 inches; packed, moist.	.006	.001	.004	.001
Soil in top water							.016		.004
Total yearly	11.85					1.944	5.470	.853	2.216
1938									
Jan. 23	2.79	2.76	2.28	1.62	Oats, 6 inches; slightly packed.	.022	.012	.016	.006
May 23	1.02	6.24	3.56	1.88	Oat stubble; slightly packed, moist.	.022	.046	.011	.049
June 8-9	2.13	3.84	2.36	1.26	Oat stubble; hard, moist.	.028	.012	.041	.023
Total yearly	5.94					.072	.070	.068	.078
1939									
Jan. 10-12	1.85	1.80	1.12	.62	Bedded; wet, loose	.032	.023		
Jan. 14-15	.56	.60	.60	.44	Bedded; wet, slightly packed.	.021	.009		
Feb. 25	1.06	2.16	1.40	1.04	Bedded; moist, slightly packed.	.033	.053		
Mar. 25	1.05	2.88	2.24	1.76	Bedded; dry, slightly packed.	.193	.430		
Mar. 28	.55	4.08	1.84	1.06	Bedded; moist, slightly packed, crusted.	.135	.642	.006	.089
Apr. 16	.80	3.60	2.48	1.44	do	.282	1.505	.012	.022
May 16	.98	3.84	2.80	1.56	Cotton, up about 2 inches; dry loose.	.147	.921	.012	.092
May 17	1.17	3.12	1.92	1.64	Cotton, 3 inches wet; slightly packed.	.683	.2682	.141	.425

TABLE 13.—*Individual storm data for storms causing runoff from control plots 4 and 5 for the 11-year period Jan. 1, 1931 to Dec. 31, 1941*—Continued

Date of all rains causing runoff	Rainfall	Intensities: 5-min. period	Intensities: 15-min. period	Intensities: 30-min. period	Crop and soil condition at time of rain	Plot 4: Depth of runoff	Plot 4: Soil loss per acre	Plot 5: Depth of runoff	Plot 5: Soil loss per acre
1939—Con.	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*
June 4	0.64	1.92	1.52	1.14	Cotton, up about 10 inches moist; loose.	0.050	0.094		
June 5	1.02	2.28	1.88	1.34	Cotton, 10 inches; wet, slightly packed.	.270	.817	0.007	0.016
June 19	1.34	2.64	2.08	1.54	Cotton, 18 inches; moist; loose.	.103	.153		
June 20	.07	.60			Cotton, 18 inches; wet, slightly packed.	.0094	.014		
Total yearly	11.09					1.958	7.343	.178	.644
1940									
Apr. 5–6	1.78	2.28	1.44	.96	Corn, 4 inches; dry, loose, flat condition.	.388	1.003	.305	.523
May 22–23	.85	2.40	1.96	1.30	Corn, 2½ feet; wet, slightly packed.	.311	.546	.083	.166
June 12	.82	2.88	2.00	1.08	Corn, 4 feet; moist, slightly packed; crusted.	.080	.403		
June 18	1.32	3.60	2.56	1.80	Corn, 4 feet; wet, slight-packed.	.508	1.078	.071	.081
June 24	1.29	1.56	1.08	.78	Corn, 4½ feet; wet, slightly packed, crusted.	.301	.879		
June 28–30	3.62	2.40	1.20	1.02	Corn, 4½ feet; wet, slightly packed.	.829	.679	.021	.014
July 2	.61	1.92	1.76	1.22	do	.225	1.112	.052	.129
July 3	.23	1.20	.40	.20	do	.025	.061		
July 12	1.87	3.60	3.28	2.88	Corn, 4½ feet; moist, loose.	.677	4.448	.447	1.196
Oct. 28	1.05	4.20	2.28	1.24	Oats, in ground; wet, flat condition.	.191	.927	.121	.611
Oct. 31	1.98	3.00	2.04	1.72	Oats, coming up; wet, slightly packed.	.791	1.359	.647	1.254
Nov. 22–25	6.67	2.76	1.52	1.20	Oats, 3–4 inches high; moist.	1.398	.941	1.836	1.025
Dec. 11	3.11	2.04	1.60	1.24	Oats, 5 inches; wet, crusted.	.385	.203	.637	.220
Dec. 12	.42	.48	.32	.24	Oats, 5 inches; saturated; slightly packed.	.012	.0015	.050	.010
Dec. 14–15	1.32	.48	.32	.28	do	.081	.009	.283	.041
Total yearly	26.94					6.202	13.650	4.553	5.270
1941									
Jan. 13	4.42	4.32	2.80	1.68	Oats, 5 inches; wet, packed.	.451	.25	.943	.27
June 2, 3	1.40	5.76	3.44	2.16	Oat stubble; topsoil dry, subsoil moist.	.004	.02	.009	.03
June 3	.94	3.00	1.64	1.34	Oat stubble; wet and packed.	.013	.01	.018	.02
June 9, 10	1.65	3.12	2.44	1.76	do	.056	.01	.025	.01
June 15, 16	1.31	4.32	3.28	1.80	Oat stubble; crusted and packed.	.011	.01	.036	.04
July 11					Oat stubble 5–8 inches			.018	.01
Aug. 6, 7	2.22	6.60	4.92	3.40	Oat stubble; topsoil moist, subsoil dry.	.020	.03	.36	.01
Total yearly	11.94					.555	.33	1.085	.39

[1] Rows down slope.
[2] Rows on contour after 1931.

TABLE 14.—*Individual storm data for plot 6 continous Bermuda grass and from plot 7 rotation: cotton, corn and oats; rows down slope*

[Plot size 1/100 acre 6 by 72.6 feet; land slope 4 percent; soil, Austin clay, formerly classified as Houston black clay]

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss			
						Plot 6 [1]		Plot 7 [2]	
		5-min-period	15-min. period	30-min. period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1931	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*
Jan. 5	0.42	4.08	1.44	0.80	Open, bedded for cotton			0.002	0.07
Feb. 22	.63	1.44	.60	.48	do			.001	.02
Feb. 23	.40	1.20	.72	.52	do			.039	.06
Mar. 30	.95	.96	.48	.36	do			.001	.006
Apr. 29	2.08	2.16	1.28	.92	Cotton			.109	.12
May 1	.79	1.68	1.16	.88	do			.228	.60
June 10	.56	4.08	2.16	1.10	do			.034	.072
July 15	1.66	3.84	2.88	2.20	do			.002	.001
Dec. 16	.97	1.44	.56	.42	Open bedded			.014	.03
Dec. 19	.58	.48	.32	.24	do			.007	.002
Total yearly	9.04							.437	.981
1932									
Jan. 4	2.41	1.20	.48	.36	Open; bedded for corn			.041	.084
Jan. 5	.45	1.44	.80	.64	do			.100	.27
Jan. 11	1.12	1.56	.96	.60	do			.151	.21
Apr. 28	1.78	3.84	2.56	1.88	Corn			.315	1.63
May 10	1.59	3.72	2.64	1.96	do			.512	2.56
May 15	2.63	4.80	2.32	1.28	do			1.547	10.72
June 10	1.02	4.56	2.64	1.52	do			.353	2.7
June 24	.79	2.64	1.60	1.00	do			.126	.76
June 25	.21	1.80	.64	.36	do			.049	.21
July 6	.65	4.08	2.40	1.26	do			.089	.58
Sept. 3	2.34	1.56	.84	.44	do			.123	.13
Total yearly	14.99							3.406	19.854
1933									
July 29-30	5.35	4.56	3.04	1.82	Oats			.143	.1
Sept. 10	4.10	3.84	3.12	2.48	Open; spaded			.173	.23
Total yearly	9.45							.316	.33
1934									
Jan. 3	.88	3.12	1.92	1.20	Open, bedded for cotton			.191	.33
Feb. 8	.94	1.44	.60	.38	do			.110	.068
Feb. 11	.42	.48	.24	.14	do			.059	.037
Feb. 18	.28	1.92	.76	.56	do			.026	.26
Mar. 1–2	1.83	2.40	1.36	1.16	do			.586	1.80
Mar. 25	1.98	2.16	1.08	1.06	do			.667	1.41
Apr. 5	1.62	3.60	2.80	1.90	do			.619	4.20
Apr. 6	1.95	3.12	1.92	1.60	do			1.532	8.11
Nov. 19–20–21	3.59	2.40	2.00	1.44	Open; bedded for corn			.835	3.04
Total yearly	13.49							4.625	19.255
1935									
Feb. 9–11	1.96	2.64	1.92	1.32	Vetch	0	0	.034	.043
Mar. 6	.46	1.68	1.48	.88	Corn	0	0	.013	.056
Apr. 2	1.72	4.32	2.64	1.80	Bermuda grass or corn	.023	.034	.806	8.185
Apr. 26	.72	4.08	1.80	.96	Corn	0	0	.009	.008
May 2	.66	3.00	1.44	1.04	Bermuda grass or corn	.002	.031	.033	.080
May 4	.32	.24	.24	.16	Corn			.017	.016
May 5	1.41	3.36	1.92	1.48	Bermuda grass or corn	.009	.022	.506	1.776
May 10	.98	2.88	1.60	.98	do	.003	.003	.130	.262
May 14	1.32	5.28	3.84	2.48	do	.010	.013	.734	5.033
May 15	1.16	4.32	2.80	1.56	do	.003	.036	.645	3.476
May 17	.17	.72	.28	.22	Corn			.010	.092
May 18	2.54	6.24	3.56	2.54	Bermuda grass or corn	.012	.014	1.762	8.217

See footnotes at end of table.

TABLE 14.—*Individual storm data for plot 6 continuous Bermuda grass and from plot 7 rotation: cotton, corn and oats; rows down slope*—Continued

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss			
						Plot 6		Plot 7	
		5-min. period	15-min. period	30-min. period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1935—Con.	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*
May 19	0.78	0.96	0.88	0.86	Corn			0.216	1.766
June 1–3	2.50	5.04	2.96	2.00	Bermuda grass or corn	0.004	0.006	.507	1.674
June 15	3.77	3.36	2.40	1.84	do	.001	.001	1.578	3.871
June 22	1.12	3.36	2.56	1.58	Corn			.275	1.834
July 27–28	.83	1.92	1.40	1.06	do			.032	.076
Sept. 7–9	3.62	2.88	1.88	1.06	do			.165	.036
Soil in top water							.001		.961
Total yearly	26.04					.067	.161	7.472	37.462
1936									
May 10	1.58	4.56	3.12	2.40	Bermuda grass; moist	.004	.003		
July 4–5	4.98	7.20	5.36	4.24	Oat stubble; moist			.369	.242
Sept. 15	2.00	4.80	3.04	2.20	Spaded Aug. 24; moist			.026	.018
Sept. 16–17	1.13	3.36	1.88	.98	Spaded; wet			.026	.070
Sept. 26–27	3.89	5.04	2.48	1.62	Spaded; wet (6); Bermuda grass; moist (7).	.004	.002	.365	1.529
Oct. 7	1.48	4.80	3.12	2.20	Vetch, 1-inch; wet, and Bermuda grass; moist.	.002	.008	.317	1.539
Oct. 23–24–25	2.87	1.20	1.20	.96	Vetch, 1-inch; wet			.053	.013
Dec. 6	1.08	4.08	2.92	1.54	do			.132	.136
Soil in top water									.104
Total yearly	17.43					.010	.014	1.288	3.651
1937									
June 6–7	.72	1.68	1.08	.62	Cotton, 10-inch; loose; moist.			.018	.069
July 9–11	3.40	3.12	2.40	2.14	Cotton, 2 feet; packed wet.			.219	.914
Nov. 9	4.88	2.76	2.32	2.12	Vetch, poor stand; loose; moist.			.754	4.078
Soil in top water									.010
Total yearly	9.00							.990	5.071
1938									
Jan. 23	2.79	2.76	2.28	1.62	Bedded; moist, slightly packed.	0	0	1.26	1.29
Feb. 16	.47	.84	.40	.32	do	0	0	.005	.008
Feb. 17–18	.41	.48	.32	.32	Bedded; wet, slightly packed.	0	0	.015	.008
Feb. 21	.55	.72	.48	.30	Bedded; moist, slightly packed.	0	0	.008	.006
Mar. 28	1.08	4.32	2.16	1.64	Corn, 7-inch; moist, flat surface.	0	0	.107	.496
Apr. 14–15	1.65	2.40	1.80	1.24	Corn, 7-inch; wet, slightly packed.	0	0	.126	.415
Apr. 27	2.46	2.64	2.08	1.68	Corn, 18-inch; wet, slightly packed, and Bermuda grass; moist, packed.	0.10	.004	.732	3.780
May 12–13	1.38	1.68	1.56	1.38	Corn, 2-foot 6-inch; wet, slightly packed.	0	0	.190	1.286
May 16	.39	1.68	.52	.32	Corn, 2-foot 9-inch; moist, slightly packed.	0	0	.030	.108
May 23	1.02	6.24	3.56	1.88	Corn, 3-foot 8-inch; moist, slightly packed, and Bermuda grass; moist, packed.	.007	.044	.502	6.963

TABLE 14.—*Individual storm data for plot 6 continuous Bermuda grass and from plot 7 rotation: cotton, corn and oats; rows down slope*—Continued

Date of all rains causing runoff	Rainfall	Intensities 5-min. period	Intensities 15-min. period	Intensities 30-min. period	Crop and soil condition at time of rain	Plot 6 Depth of runoff	Plot 6 Soil loss per acre	Plot 7 Depth of runoff	Plot 7 Soil loss per acre
1938—Con.	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*
June 8-9	2.113	3.84	2.36	1.26	Corn, 5-foot 6-inch; moist, slightly packed; and Bermuda grass; saturated.	0.005	0.016	0.577	1.118
Total yearly	14.33					.022	.064	2.418	14.321
1939									
Jan. 10-12	1.85	1.80	1.12	.62	Oats, 3-inch; wet; slightly packed.			.037	.054
Jan. 14-15	.56	.60	.60	.44	do			.015	.022
Feb. 25	1.06	2.16	1.40	1.04	Oats, 5-inch; moist, slightly packed.			.010	.029
Mar. 25	1.05	2.88	2.24	1.76	Oats, 6-inch; dry; slightly packed.			.013	.040
Mar. 28	.55	4.08	1.84	1.06	Oats, 6-inch; moist, packed, and Bermuda grass; moist, packed.	.0021	.0045	.008	.035
June 5	1.02	2.28	1.88	1.34	Oat stubble; wet, packed.			.016	.016
June 19	1.34	2.64	2.08	1.54	Oat stubble; moist; packed.			.022	.013
Total yearly	7.43					.002	.010	.121	.210
1940									
Apr. 5-6	1.78	2.28	1.44	.96	In beds; dry, slightly packed.			.491	.842
May 22-23	.85	2.40	1.96	1.30	Cotton, 5-inch; wet slightly packed.			.312	.449
June 12	.82	2.88	2.00	1.08	Cotton, 12-inch; moist, slightly packed.			.060	.400
June 18	1.32	3.60	2.56	1.80	Cotton, 15-inch; wet, slightly packed.			.496	1.633
June 24	1.29	1.56	1.08	.78	Cotton, 18-20-inch; moist, slightly packed.			.208	.541
June 28-30	3.62	2.40	1.20	1.02	Cotton, 2-foot; moist, packed, crusted.			.389	1.013
July 2	.61	1.92	1.76	1.22	Cotton, 2-foot; wet, packed, crusted.			.228	.664
July 3	.23	1.20	.40	.20	Cotton up about 2 feet; wet; packed.			.018	.022
July 12	1.87	3.60	3.28	2.88	Cotton, 2½-foot; moist, and loose.			.372	1.515
Oct. 28	1.05	4.20	2.28	1.24	Stalks cut, spaded; wet, and loose.			.006	.031
Oct. 31	1.98	3.00	2.04	1.72	Stalks cut, spaded; wet, slightly packed.			.015	.018
Nov, 22-25	6.67	2.76	1.52	1.20	Land in beds; moist			.574	1.611
Dec. 11	3.11	2.04	1.60	1.24	Land in beds; wet, crusted.			1.182	3.905
Dec. 12	.42	.48	.32	.24	Land in beds; saturated.			.164	.134
Dec. 14-15	1.32	.48	.32	.28	Land in beds; saturated, slightly packed.			.808	.441
Total yearly	26.94							5.323	13.219
1941									
Jan. 13	4.42	4.32	2.80	1.68	Bermuda grass, 1-foot 3-inches; wet, packed and bedded.	.090	.022	.253	9.64
Feb. 22-23	1.29	1.44	.72	.44	Bedded; wet, packed			.059	.06
Mar. 5-6	1.48	2.04	1.60	1.04	Bedded; wet, crusted			.198	.41

TABLE 14.—*Individual storm data for plot 6 continuous Bermuda grass and from plot 7 rotation: cotton, corn and oats; rows down slope*—Continued

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss			
						Plot 6		Plot 7	
		5-min-period	15-min. period	30-min. period		Depth of run-off	Soil loss per acre	Depth of run-off	Soil loss per acre
1941—Con.	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*
Apr. 2	.95	5.28	3.28	1.88	Corn, 1–3 inches; moist, crusted, flat surface.			0.121	0.71
Apr. 6	.63	2.16	1.84	1.08	Corn, 4 inches; moist, crusted flat surface.			.107	.66
Apr. 21–23	1.41	2.64	1.68	1.64	Corn, 4–7 inches; packed			.431	.83
Apr. 23–24	.92	3.12	1.20	.68					
Apr. 27	.30	.60	.40	.32	Corn, 4–7 inches; very wet and packed.			.010	.00
Apr. 28	.55	1.20	1.04	.74	Corn, 5–7 inches; very wet and packed.			.063	.11
May 2	.88	1.56	.92	.78	do			.035	.04
May 5	.72	3.36	2.48		Corn, 8–12 inches; very wet and packed.			.134	.75
May 11	1.05	5.52	3.84	2.10	Corn, 8–12 inches; loose, recently plowed.			.121	1.16
May 21	1.13	2.16	1.36	1.04	Corn, 12–20 inches; loose, moist.			.075	.18
June 2, 3	1.40	5.76	3.44	2.16	Corn, 28–40 inches; topsoil dry, subsoil moist.			.346	1.14
June 3	.94	3.00	1.64	1.34	Corn, 28–40 inches; wet and packed.			.365	1.49
June 9, 10	1.65	3.12	2.44	1.76	Corn, 19–55 inches; wet and packed.			.392	1.06
June 15, 16	1.31	4.32	3.28	1.80	Corn, 2–4½ feet, crusted, packed.			.596	1.93
July 11	2.92	3.12	2.00	1.40	Corn, 5–6 feet; loose, freshly plowed.			.866	1.58
Aug. 6, 7	2.22	6.60	4.92	3.40	Corn, drying up; topsoil moist, subsoil dry.			1.254	4.20
Oct. 4	.76	1.44	.88	.54	Corn, stubble; topsoil moist, subsoil dry.			.009	.01
Oct. 7	.18	2.16			Corn, stubble; wet and packed.			.026	.06
Total yearly	27.11					.090	.022	7.462	26.02

[1] Plot 6, continuous Bermuda grass.
[2] Plot 7, rotation: cotton, corn, oats, with green-manure winter cover after cotton for the first two rotation cycles.

TABLE 15.—*Individual storm data for control plots 8, 10, and 11, Jan. 1, 1931, to Dec. 31, 1941*

[Plot size 1/100 acre, 6 by 72.6 feet; land slope 4 percent; crop rotation: corn, oats, and cotton; soil Austin clay, formerly classified Houston black clay]

Date of all rains causing runoff	Rainfall	Intensities: 5-minute period	Intensities: 15-minute period	Intensities: 30-minute period	Crop and soil condition at time of rain	Water and soil loss: Plot 8 [1] Depth of runoff	Plot 8 [1] Soil loss per acre	Plot 10 [2] Depth of runoff	Plot 10 [2] Soil loss per acre	Plot 11 [3] Depth of runoff	Plot 11 [3] Soil loss per acre
1931	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*	*In.*	*Tons*
Jan. 5	0.42	4.08	1.44	0.80	Open; bedded for corn	0.001	0.06	0.003	0.06	0.005	0.04
Feb. 13	.59	3.48	1.72	.96	do	0	0	.007	.025	.003	.007
Feb. 22	.63	1.44	.60	.48	do	.002	.005	.003	.02	.003	.005
Feb. 23	.40	1.20	.72	.52	do	.024	.03	.042	.06	.001	.005
Mar. 30	.95	.96	.48	.36	Corn	.001	.004	.001	.006	0	0
Apr. 29	2.08	2.16	1.28	.92	do	.113	.10	.031	.02	.013	.01
May 1	.79	1.68	1.16	.88	do	.303	.515	.161	.21	.149	.14
July 15	1.66	3.84	2.88	2.20	do	.001	.001	.004	.003	.132	.115
Dec. 16	.97	1.44	.56	.42	Oats	0	0	.001	.012	T	.004
Dec. 19	.58	.48	.32	.24	do	.001	.001	.003	.002	T	.001
Total yearly	9.07					.446	.716	.256	.418	.306	.327
1932											
Jan. 4	2.41	1.20	.48	.36	Oats	0	0	0	0	.002	.007
Jan. 5	.45	1.44	.80	.64	do	.007	.029	.010	.024	.028	.088
Jan. 11	1.12	1.56	.96	.60	do	.009	.014	.021	.025	.007	.124
May 15	2.63	4.80	2.32	1.28	do	0	0	0	0	.423	.47
Dec. 23	1.76	3.36	2.56	2.08	Open; spaded	.082	.39	0	0	.193	.595
Total yearly	8.37					.098	.433	.031	.049	.653	1.284
1933											
Mar. 5	.92	3.96	2.08	1.28	Open; bedded for cotton	.137	1.03	0	0	.156	1.27
May 3	1.00	3.12	1.80	1.22	Cotton	.170	1.12	.065	.21	.126	1.12
May 25	1.97	2.64	1.92	1.38	do	.316	1.24	0	0	.258	1.93
May 29	.60	1.92	1.40	.92	do	.066	.32	0	0	.135	1.00
July 29–30	5.35	4.56	3.04	1.82	do	1.009	2.15	.045	0	1.648	8.16
Aug. 24	1.35	4.12	3.20	2.04	do	.00	0	0	0	.282	2.76
Sept. 10	4.10	3.84	3.12	2.48	do	.598	1.99	.562	.61	2.752	13.88
Oct. 1	.76	1.92	1.44	.84	do	0	0	0	0	.115	.29
Total yearly	16.05	26.08	18.00	11.98		2.296	7.85	.672	.82	5.472	30.41

See footnotes at end of table.

TABLE 15.—*Individual storm data for control plots 8, 10, and 11, Jan. 1, 1931, to Dec. 31, 1941*—Continued

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss					
						Plot 8		Plot 10		Plot 11	
		5-minute period	15-minute period	30-minute period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1934	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*	*In.*	*Tons*
Jan. 3	0.88	3.12	1.92	1.20	Open; bedded for corn	0.094	0.245	0	0	0.104	0.49
Feb. 8	.94	1.44	.60	.38	do	.030	.024	0	0	.068	.178
Feb. 11	.42	.48	.24	.14	do	.026	.019	0	0	.025	.043
Feb. 18	.28	1.92	.76	.56	do	.024	.115	0	0	.038	.30
Mar. 1–2	1.83	2.40	1.36	1.16	do	.422	2.455	0	0	.323	1.765
Mar. 25	1.98	2.16	1.08	1.06	Corn	.038	.13	0	0	.028	.068
Apr. 5	1.62	3.60	2.80	1.90	do	.229	2.615	.183	.455	.188	1.58
Apr. 6	1.95	3.12	1.92	1.60	do	1.025	4.165	1.000	1.37	1.127	2.775
Aug. 26	.30	2.88	1.20	.60	do	.012	.032	0	0	.095	.257
Sept. 11	.38	1.20	.84	.66	do	0	0	0	0	.069	1.29
Sept. 14	.29	1.20	.72	.48	do	.014	.195	0	0	.012	.287
Nov. 14–15	2.21	1.44	.80	.70	Oats	.202	.587	2.007	.388	.399	.467
Nov. 19–20–21	3.59	2.40	2.00	1.44	do	1.407	4.725	1.717	4.455	1.445	2.07
Nov. 29	.32	.24	.24	.20	do	.027	.348	0	0	.009	.119
Total yearly	16.99	27.60	16.48	12.08		3.550	15.655	3.907	6.668	3.930	11.696
1935											
Feb. 9–10–11	1.96	2.64	1.92	1.32	Oats; killed by freeze 1–21–35; replanted 2–5–35.	.150	.052	.008	.083	.016	.010
Mar. 6	.46	1.68	1.48	.88	Oats	.011	.105	0	0	.008	.025
Apr. 2	1.72	4.32	2.64	1.80	do	.096	.072	.007	.012	.526	1.711
May 2	.66	3.00	1.44	1.04	do	0	0	0	0	.023	.012
May 4	.32	.24	.24	.16	do	0	0	0	0	.003	.002
May 5	1.41	3.36	1.92	1.48	do	0	0	0	0	.463	.235
May 10	.98	2.88	1.60	.98	do	0	0	0	0	.024	.010
May 14	1.32	5.28	3.84	2.48	do	0	0	0	0	.360	.247
May 15	1.16	4.32	2.80	1.56	do	0	0	0	0	.497	.252
May 17	.17	.72	.28	.22	do	0	0	0	0	.002	.001
May 18	2.54	6.24	3.56	2.54	do	.128	.028	0	0	1.670	.395
May 19	.78	.96	.88	.86	do	0	0	0	0	.093	.158
June 1–3	2.50	5.04	2.96	2.00	do	.002	.005	0	0	.464	.342
June 15	3.77	3.36	2.40	1.84	do	.115	.017	0	0	2.817	.984
June 22	1.12	3.36	2.56	1.58	do	.025	.023	0	0	.259	.321
July 26	.24	1.92	.96	0	do	0	0	0	0	.133	.325
July 27–28	.83	1.92	1.40	1.06	do	0	0	0	0	.193	.167

Sept. 7-8-9	3.62	2.88	1.88	1.06	Open; spaded	0	0	0	0	0.670	0.306
Dec. 6	4.12	4.20	2.40	1.80	do	.232	.435	0	0	1.287	1.219
Soil in top water							.026		0		.381
Total yearly	29.68	58.32	37.16	24.66		.759	.763	.015	.095	9.508	7.103
1936											
Apr. 16	.80	1.20	.80	.44	Open; moist, bedded	0	0	0	0	.024	.135
Apr. 28	2.00	4.80	3.12	2.16	Open; moist; loose	.581	4.499	.557	2.034	.694	2.392
May 8	1.10	3.60	2.72	1.76	Cotton, 2 inches; moist; cotton plowed May 7.	.186	2.006	.014	.009	.136	1.238
May 10	1.58	4.56	3.12	2.40	do	.741	9.183	.384	.958	.819	7.986
May 22	.65	3.60	1.92	1.10	Cotton, 8 inches; moist; cotton plowed May 18.	.103	.680	0	0	.102	.982
May 24-26, 27-28	4.28	2.40	1.56	.90	Cotton, 10 to 12 inches; moist for plots 8 and 11; wet for plot 10; cotton plowed May 18.	1.533	4.476	.026	.054	1.346	2.725
July 4-5	4.98	7.20	5.36	4.24	Cotton, 3 feet; wet	2.860	25.640	2.288	4.452	3.744	30.492
Sept. 15	2.00	4.80	3.04	2.20	Cotton stalks, moist	0	0	0	0	.129	.864
Sept. 16-17	1.13	3.36	1.88	.98	Cotton stalks, wet (11); cotton stalks wet, cotton picked (8 and 10).	.173	.990	.079	.064	.355	4.223
Sept. 26-27	3.89	5.04	2.48	1.62	Open; wet (11); drilled to vetch, wet (8 and 10).	1.265	3.298	.866	1.398	1.813	6.448
Oct. 7	1.48	4.80	3.12	2.20	Open; wet (11); vetch 1 inch wet; (8 and 10).	.338	1.984	.328	1.814	.443	2.056
Dec. 6	1.08	4.08	2.92	1.54	Open; bedded (11) vetch 6 inches wet (8 and 10).	.009	.026	.026	.009	.021	.004
Dec. 27	1.18	3.60	1.64	1.00	Vetch, 6 inches wet	0	0	.009	.007	0	0
Soil in top water							.558		.302		.534
Total yearly	26.15	53.04	33.68	22.54		77.89	53.340	4.577	11.101	9.626	60.079
1937											
Mar. 4	1.68	1.44	1.32	.92	Corn, planted Mar. 1; loose; moist.	.014	.020	0	0	0	0
June 6-7	.72	1.68	1.08	.62	Corn, 4 feet 6 inches; loose; moist; (8); corn 3 feet 6 inches crusted; moist (11).	.060	.130	0	0	.100	.485
July 9-10-11	3.40	3.12	2.40	2.14	Corn, 6 feet packed wet (8 and 10); corn 4 feet 6 inches, packed wet (11).	.582	2.816	.193	.164	.750	4.964
Aug. 31	1.22	2.40	1.88	1.72	Cornstalks, dry, cracked	.017	.014	0	0	.318	.781
Nov. 9	4.88	2.76	2.32	2.12	Oats, 1 inch; loose; dry	1.320	3.216	1.072	1.798	1.785	4.037
Dec. 21-22	1.63	.48	.44	.42	Oats, 3 inches; loose; moist (10); oats 3 inches packed, slightly moist (11).	0	0	.027	.001	.022	.027
Soil in top water							.027		.006		.044
Total yearly	13.53	11.88	9.44	7.94		1.993	6.223	1.292	1.969	2.975	10.828

See footnotes at end of table.

TABLE 15.—*Individual storm data for control plots 8, 10, and 11, Jan. 1, 1931, to Dec. 31, 1941*—Continued

Date of all rains causing runoff	Rainfall	Intensities: 5-minute period	Intensities: 15-minute period	Intensities: 30-minute period	Crop and soil condition at time of rain	Plot 8: Depth of runoff	Plot 8: Soil loss per acre	Plot 10: Depth of runoff	Plot 10: Soil loss per acre	Plot 11: Depth of runoff	Plot 11: Soil loss per acre
1938	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*	*In.*	*Tons*
Jan. 23	2.79	2.76	2.28	1.62	Oats, 6 inches; moist; slightly packed (8 and 10); oats 3 inches; moist; slightly packed (11).	0.028	0.016	0.043	0.007	1.118	0.460
Feb. 16	.47	.84	.40	.32	Oats, 4 inches; wet; slightly packed.	0	0	0	0	.021	.010
Feb. 17–18	.41	.48	.32	.32	do	0	0	0	0	.011	.004
Feb. 21	.55	.72	.48	.30	Oats, 4 inches; moist, slightly packed.	0	0	0	0	.046	.008
Mar. 28	1.08	4.32	2.16	1.64	Oats, 10 inches dry; hard	0	0	0	0	.053	.023
Apr. 14–15	1.65	2.40	1.80	1.24	Oats, 12–16 inches; moist; firm.	0	0	0	0	.508	.178
Apr. 27	2.46	2.64	2.08	1.68	Oats, 1 foot 8 inches; moist, slightly packed.	0	0	0	0	1.560	1.092
May 7	.95	2.40	1.44	1.18	Oats, 2 feet, moist; slightly packed.	0	0	0	0	.116	.084
May 12–13	1.38	1.68	1.56	1.38	Oats, 2 feet, wet; slightly packed.	0	0	0	0	.454	.552
May 16	.39	1.68	.52	.32	Oats, 2 feet, moist; slightly packed.	0	0	0	0	.083	.053
May 23	1.02	6.24	3.56	1.88	Oat stubble, moist; slightly packed.	.025	.027	.009	.010	.422	1.064
June 8–9	2.13	3.84	2.36	1.26	Oat stubble, moist, hard	.116	.068	.038	.018	1.044	.988
Total yearly	15.28	30.00	18.96	13.14		.169	.111	.090	.035	5.436	4.516
1939											
Jan. 10–11	1.85	1.80	1.12	.62	In beds; wet and loose	.040	.208	0	0	.052	.038
Jan. 14–15	.56	.60	.60	.44	In beds; wet, slightly packed	.064	.046	0	0	.049	.022
Feb. 25	1.06	2.16	1.40	1.04	In beds; moist, slightly packed.	.062	.109	0	0	.078	.158
Mar. 25	1.05	2.88	2.24	1.76	In beds; dry, slightly packed	.192	.753	0	0	.310	1.435
Mar. 28	.55	4.08	1.84	1.06	In beds; moist, slightly packed; crusted.	.134	.644	.005	.046	.261	1.730
Apr. 16	.80	3.60	2.48	1.44	do	.211	1.039	.010	.026	.436	2.026
May 16	.98	3.84	2.80	1.56	Cotton, 2-inch; dry, loose (8 and 11); cotton, 3-inch dry, loose (10).	.109	1.000	.014	.071	.189	3.484

May 17	1.17	3.12	1.92	1.64	Cotton, 3-inch; wet, slightly packed (10 and 11); cotton, 2-inch, wet, slightly packed (8).	.671	3.073	.193	.448	.810	4.186
June 4	.64	1.92	1.52	1.14	Cotton, 10-inch, moist; loose (8); cotton, 7-inch, moist, loose (11).	.040	.079	0	0	.139	.193
June 5	1.02	2.28	1.88	1.34	Cotton, 10-inch wet, slightly packed (8 and 10); cotton, 7-inch; wet and slightly packed (11).	.324	1.041	.017	.051	.427	1.112
June 19	1.34	2.64	2.08	1.54	Cotton, 18-inch, moist, loose (8); cotton, 12-inch, moist, loose (11).	.080	.127	0	0	.192	1.016
June 20	.07	.60	0	0	Cotton, 18-inch, wet; slightly packed (8); cotton, 12-inch slightly packed (11).	.009	.012	0	0	.015	.039
Total yearly	11.09	29.52	19.88	13.58		1.936	8.131	0.239	.642	2.958	15.439
1940											
Apr. 5-6	1.78	2.28	1.44	.96	Corn, 4-inch, dry; loose, flat condition.	.294	.511	.291	.430	.264	.449
May 22-23	.85	2.40	1.96	1.30	Corn, 2½-foot, wet; slightly packed.	.334	.481	.091	.091	.427	.569
June 12	.82	2.88	2.00	1.08	Corn, 5-foot, moist; slightly packed (8); corn, 2-3 foot moist, slightly packed (11).	.109	.914	0	0	.174	.648
June 18	1.32	3.60	2.56	1.80	Corn, 5-foot, wet, slightly packed (8 and 10); corn, 2-3-foot, wet, slightly packed (11).	.526	1.868	.183	.426	.730	2.539
June 24	1.29	1.56	1.08	.78	Corn, 3-foot, wet; slightly packed, crusted (for 11); corn, 5-foot, wet; slightly packed (8), crusted (10).	.346	1.011	.124	.160	.451	.941
June 28-30	3.62	2.40	1.20	1.02	Corn, 5-foot, wet; packed, crusted (8 and 10); corn, 3-foot, wet, slightly packed, crusted (11).	1.055	1.019	.320	.256	1.417	1.628
July 2	.61	1.92	1.76	1.22	Corn, 3-foot, wet; slightly packed, crusted (11); corn, 5-foot, wet; packed, crusted (10) and (8).	.245	1.430	.109	.321	.356	1.429
July 3	.23	1.20	.40	.20	Corn, 5-foot, wet; packed (8) corn, 3-foot, wet; slightly packed (11).	.007	.009	0	0	.054	.113
July 12	1.87	3.60	3.28	2.88	Corn, 5-foot, moist; loose (8); corn, 3-foot, moist; loose (11); plot 10 same as (8).	.826	7.601	.560	1.999	.879	6.154

TABLE 15.—*Individual storm data for control plots 8, 10, and 11, Jan. 1, 1931, to Dec. 31, 1941*—Continued

Date of all rains causing runoff	Rainfall	Intensities			Crop and soil condition at time of rain	Water and soil loss					
						Plot 8 [1]		Plot 10 [2]		Plot 11 [3]	
		5-minute period	15-minute period	30-minute period		Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre	Depth of runoff	Soil loss per acre
1940—Continued	*In.*	*In. per hr.*	*In. per hr.*	*In. per hr.*		*In.*	*Tons*	*In.*	*Tons*	*In.*	*Tons*
Oct. 28	1.05	4.20	2.28	1.24	Oats in ground, wet, flat condition.	0.137	0.457	0.187	0.855	0.201	0.773
Oct. 31	1.98	3.00	2.04	1.72	Oats, coming up; wet, slightly packed.	.675	1.010	.857	1.425	.914	.949
Nov. 22–25	6.67	2.76	1.52	1.20	Oats, 3–4-inch, moist	1.968	1.523	2.152	1.140	2.722	1.983
Dec. 11	3.11	2.04	1.60	1.24	Oats, 5-inch, wet; crusted (8 and 10); oats, 4-inch, wet; crusted (11).	.521	.227	.495	.198	1.446	.687
Dec. 12	.42	.48	.32	.24	Oats, 5-inch; saturated (8 and 10), slightly packed; oats; 4 inches; saturated, slightly packed (11).	.044	.010	.059	.009	.102	.021
Dec. 14–15	1.32	.48	.32	.28	do	.280	.036	.410	.060	.612	.078
Total yearly	26.94	34.80	23.76	17.16		7.367	18.107	58.38	7.370	10.749	18.961
1941											
Jan. 13	4.42	4.32	2.80	1.68	Oats, 5 inches; wet, packed (8 and 10); oats 3 inches wet packed (11).	1.068	.31	1.472	.27	3.492	3.29
Feb. 22–23	1.29	1.44	.72	.44	Oats, 6–7 inches; wet	0	0	0	0	.012	.01
Mar. 5, 6	1.48	2.04	1.60	1.04	Oats, 6–7 inches; wet, packed	0	0	0	0	.101	.05
Apr. 2	.95	5.28	3.28	1.88	Oats, 12 inches; moist, packed	0	0	0	0	.302	.62
Apr. 6	.63	2.16	1.84	1.08	do	0	0	0	0	.124	.06
Apr. 21–23	1.41	2.64	1.68	1.64	Oats, 24–30 inches; moist, packed.	0	0	0	0	.839	.49
Apr. 23–24	.92	3.12	1.20	.68							
Apr. 27	.30	.60	.40	.32	Oats, 24–30 inches; very wet and packed.	0	0	0	0	.029	.00
Apr. 28	.55	1.20	1.04	.74	Oats, 32–44 inches; very wet and packed.	0	0	0	0	.187	.02
May 5	.72	3.36	2.48		do	0	0	0	0	.330	.04
May 11	1.05	5.52	3.84	2.10	Oats, 36–44 inches, moist, and packed.	0	0	0	0	.242	.03
May 21	1.13	2.16	1.36	1.04	Oat stubble, 5–8 inches; wet and packed.	0	0	0	0	.138	.06

June 2, 3	1.40	5.76	3.44	2.16	Oat stubble, 5-8 inches; topsoil dry, subsoil moist.	.007	.01	0	0	.619	.34
June 3	.94	3.00	1.64	1.34	Oat stubble, 5-8 inches; wet and packed.	.009	.01	.021	.01	.465	.31
June 9, 10	1.65	3.12	2.44	1.76	do	.023	.01	.014	.01	.873	.38
June 15, 16	1.31	4.32	3.28	1.80	Oat stubble, 5-8 inches; crusted, packed.	.033	.07	.150	.04	.760	.54
July 11	2.92	3.12	2.00	1.40	do	0	0	.008	0	1.812	.59
Aug. 6-7	2.22	6.60	4.92	3.40	Oat stubble, 5-8 inches; topsoil moist, subsoil dry.	.008	.01	.013	.01	1.144	.40
Total yearly	25.29	59.76	39.96	24.50		1.148	.42	1.678	.34	11.469	7.21

[1] Rows on contour 1931; down slope 1932-41; soil, Austin clay, normal surface (plot 8).
[2] Rows on contour; soil, Austin clay, normal surface (plot 10).
[3] Rows down slope; soil, Austin clay with 15 inches of topsoil removed (plot 11).

TABLE 16.—*Individual storm data from plot 9, Jan. 1, 1931, to Dec. 31, 1941*

[Plot size; 1/100 acre 6 by 72.6 feet; land slope, 4 percent; crop rotation: oats, cotton, corn; rows down slope; soil, Austin clay formerly classified as Houston black clay]

Date of rain	Rainfall	Intensities: 5-minute period	Intensities: 15-minute period	Intensities: 30-minute period	Crop and condition of area at time of storm	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
1931	*In.*	*In per hr.*	*In per hr.*	*In per hr.*		*In.*	*Pct.*	*Tons*
Jan. 5	0.42	4.08	1.44	0.80	Oats	0.002	0.48	0.07
Feb. 13	.59	3.48	1.72	.96	do	.006	1.02	.01
Feb. 22	.63	1.44	.60	.48	do	.008	1.27	.02
Feb. 23	.40	1.20	.72	.52	do	.059	14.75	.11
Dec. 16	.97	1.44	.56	.42	Open spaded	0		.003
Dec. 19	.58	.48	.32	.24	do	.001	.17	T
Total yearly	23.44					.076	.32	.213
1932								
Jan. 5	.45	1.44	.80	.64	Open; bedded for cotton	.015	3.33	.028
Jan. 11	1.12	1.56	.96	.60	do	.048	4.29	.05
Apr. 28	1.78	3.84	2.56	1.88	Cotton	.299	16.80	.97
May 10	1.59	3.72	2.64	1.96	do	.251	15.79	1.30
May 15	2.63	4.80	2.32	1.28	do	1.414	53.76	5.47
June 10	1.02	4.56	2.64	1.52	do	.163	15.98	1.19
June 24	.79	2.64	1.60	1.00	do	.026	3.29	.09
June 25	.21	1.80	.64	.36	do	.024	11.43	.065
Total yearly	31.25					2.240	7.17	9.163
1933								
Mar. 5	.92	3.96	2.08	1.28	Open; bedded for corn	.174	18.91	.84
May 3	1.00	3.12	1.80	1.22	Corn	.166	16.60	1.44
May 25	1.97	2.64	1.92	1.38	do	.148	7.51	.32
May 29	.60	1.92	1.40	.92	do	.066	11.00	.35
July 29–30	5.35	4.56	3.04	1.82	do	1.321	24.69	1.89
Aug. 24	1.35	4.12	3.20	2.04	do	.373	27.63	2.32
Sept. 10	4.10	3.84	3.12	2.48	Open; spaded	1.487	36.27	4.37
Total yearly	25.68					3.735	14.54	11.530
1934								
Nov. 14–15	2.21	1.44	.80	.70	Vetch	.008	.36	.147
Nov. 19–20–21	3.59	2.40	2.00	1.44	do	.465	12.95	.845
Total yearly	29.68					.473	1.59	.992
1935								
Feb. 9–10–11	1.96	2.64	1.92	1.32	Vetch	.004	.20	.019
Mar. 6	.46	1.68	1.48	.88	Open; bedded for cotton	.008	1.74	.029
Apr. 2	1.72	4.32	2.64	1.80	do	.834	48.49	6.429
Apr. 26	.72	4.08	1.80	.96	Cotton	.014	1.94	.026
May 2	.66	3.00	1.44	1.04	do	.038	5.76	.323
May 4	.32	.24	.24	.16	do	.005	1.56	.006
May 5	1.41	3.36	1.92	1.48	do	.394	27.94	1.727
May 10	.98	2.88	1.60	.98	do	.120	12.24	.352
May 14	1.32	5.28	3.84	2.48	do	.639	48.41	2.963
May 15	1.16	4.32	2.80	1.56	do	.604	52.07	2.526
May 17	.17	.72	.28	.22	do	.004	2.35	.016
May 18	2.54	6.24	3.56	2.54	do	1.530	60.24	5.307
May 19	.78	.96	.88	.86	do	.178	22.82	1.306
June 1–3	2.50	5.04	2.96	2.00	do	.477	19.08	1.272
June 15	3.77	3.36	2.40	1.84	do	1.290	34.22	2.828
June 22	1.12	3.36	2.56	1.58	do	.056	5.00	.340
Sept. 24	.85	4.56	3.20	1.70	Vetch	.078	9.18	.381
Dec. 6	4.12	4.20	2.40	1.80	do	.271	6.58	.482
Soil in top water								.972
Total yearly	46.65					6.544	14.03	27.304
1936								
Apr. 28	2.00	4.80	3.12	2.16	Corn; 12 inches; loose; moist	.539	26.95	4.215
May 8	1.10	3.60	2.72	1.76	Corn; 14 inches; moist; plowed May 8.	.187	16.98	1.910
May 10	1.58	4.56	3.12	2.40	do	.952	60.23	9.678
May 22	.65	3.60	1.92	1.10	Corn; 2 feet; moist; plowed May 19.	.138	21.17	.986

TABLE 16.—*Individual storm data from plot 9, Jan. 1, 1931, to Dec. 31, 1941*—Continued

Date of rain	Rainfall	Intensities: 5-minute period	Intensities: 15-minute period	Intensities: 30-minute period	Crop and condition of area at time of storm	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
1936—Con.	*In.*	*In per hr.*	*In per hr.*	*In per hr.*		*In.*	*Pct.*	*Tons*
May 24-26-27-28	4.28	2.40	1.56	0.90	Corn; 2 feet 6 inches; wet	1.339	31.29	2.274
July 4-5	4.98	7.20	5.36	4.24	Corn; 5 feet 6 inches; wet; packed.	3.466	69.60	27.008
July 23	.32	2.16	1.20	.64	Corn; 5 feet 6 inches; wet; loose.	.027	8.34	.064
Sept. 15	2.00	4.80	3.04	2.20	Open; loose; spaded	.035	1.76	.042
Sept. 16-17	1.13	3.36	1.88	.98	Open; loose; spaded; saturated.	.026	2.34	.024
Sept. 26-27	3.89	5.04	2.48	1.62	Open; loose; saturated	1.405	36.13	3.118
Oct. 7	1.48	4.80	3.12	2.20	Oats; 1 inch; wet	.442	29.84	2.492
Oct. 23-24-25	2.87	1.20	1.20	.96	Oats; 2 inches; wet	.039	1.35	.008
Nov. 3	.65	.72	.52	.38	Oats; 3 inches; moist	.004	.68	.006
Dec. 6	1.08	4.08	2.92	1.54	Oats; 5 inches; moist	.018	1.67	.028
								.662
Total yearly	39.85					8.617	21.62	52.515
1937								
Nov. 9	4.88	2.76	2.32	2.12	Vetch; poor stand; loose; moist.	1.666	34.15	2.935
Total yearly	28.60					1.666	5.825	2.935
1938								
Jan. 23	2.79	2.76	2.28	1.62	Bedded; moist; slightly packed.	.271	9.71	.147
Feb. 16	.47	.84	.40	.32	do	.010	2.13	.014
Feb. 17-18	.41	.48	.32	.32	do	.022	5.36	.013
Feb. 21	.55	.72	.48	.30	do	.015	2.73	.010
Mar. 28	1.08	4.32	2.16	1.64	do	.148	13.70	.538
Apr. 14-15	1.65	2.40	1.80	1.24	Bedded; wet; slightly packed.	.410	24.85	1.094
Apr. 27	2.46	2.64	2.08	1.68	Cotton; wet; flat surface	1.146	46.59	4.438
May 7	.95	2.40	1.44	1.18	Cotton, 2 to 3 inches; slightly packed, wet.	.162	17.05	.556
May 12-13	1.38	1.68	1.56	1.38	Cotton, 3 to 4 inches; slightly packed, wet.	.361	26.16	.999
May 16	.39	1.68	.52	.32	Cotton, 4 to 6 inches; moist; slightly packed.	.029	7.44	.098
May 23	1.02	6.24	3.56	1.88	Cotton, 6 to 8 inches; moist; slightly packed.	.518	50.78	6.234
June 8-9	2.13	3.84	2.36	1.26	Cotton, 12 inches; moist; loose.	.790	37.09	1.837
Total yearly	27.58					3.882	14.07	15.978
1939								
Jan. 10-12	1.85	1.80	1.12	.62	In beds; wet and loose	.017	.92	.021
Jan. 14-15	.56	.60	.60	.44	In beds; wet and slightly packed.	.049	8.75	.033
Feb. 25	1.06	2.16	1.40	1.04	In beds; moist and slightly packed.	.058	5.47	.085
Mar. 25	1.05	2.88	2.24	1.76	Corn up about 2 inches; dry, loose; flat condition.	.219	20.86	2.552
Mar. 28	.55	4.08	1.84	1.06	Corn up about 3 inches; moist; slightly packed.	.199	36.18	1.137
Apr. 16	.80	3.60	2.48	1.44	Corn up about 9 inches; moist; slightly packed.	.268	33.50	1.269
May 16	.98	3.84	2.80	1.56	Corn up about 2½ feet high; dry, loose condition.	.237	24.18	1.765
May 17	1.17	3.12	1.92	1.64	Corn up about 2½ feet high; wet, slightly packed	.972	83.08	3.799
June 4	.64	1.92	1.52	1.14	Corn up 5½ feet high; wet and loose.	.036	5.62	.063
June 5	1.02	2.28	1.88	1.34	Corn up 5½ feet high; wet, slightly packed.	.298	29.22	.551
June 19	1.34	2.64	2.08	1.54	Corn up 6½ feet high; moist, slightly packed.	.145	10.82	.443
June 20	.07	.60			Corn up 6½ feet high; wet, slightly packed.	.017	24.29	.040
Total yearly	23.77					2.515	10.58	11.758

TABLE 16.—*Individual storm data from plot 9, Jan. 1, 1931, to Dec. 31, 1941*—Continued

Date of rain	Rainfall	Intensities 5-minute period	15-minute period	30-minute period	Crop and condition of area at time of storm	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
1940	*In.*	*In per hr.*	*In per hr.*	*In per hr.*		*In.*	*Pct.*	*Tons*
May 22–23	0.85	2.40	1.96	1.30	Oat stubble; 4 inches; wet, slightly packed.	0.023	2.71	0.019
June 12	.82	2.88	2.00	1.08	Oat stubble; 4 inches; moist, packed, crusted.	.109	13.30	.219
June 18	1.32	3.60	2.56	1.80	Oat stubble; 4 inches; wet, slightly packed.	.493	37.35	.629
June 24	1.29	1.56	1.08	.78	Oat stubble; 4 inches; moist, packed, crusted.	.072	5.58	.03
June 28–30	3.62	2.40	1.20	1.02	do	.185	5.11	.098
July 2	.61	1.92	1.76	1.22	Oat stubble; wet, packed, crusted.	.131	21.48	.201
July 3	.23	1.20	.40	.20	Oat stubble; wet, packed	.009	3.91	.011
July 12	1.87	3.60	3.28	2.88	Oat stubble; moist, packed, crusted.	.414	22.14	.499
Oct. 28	1.05	4.20	2.28	1.24	Fallow; wet, loose	.116	11.05	.414
Oct. 31	1.98	3.00	2.04	1.72	Fallow; wet, slightly packed	.522	26.36	.523
Nov. 22–25	6.67	2.76	1.52	1.20	Land in beds; moist	2.555	38.31	5.667
Dec. 11	3.11	2.04	1.60	1.24	Land in beds; wet, crusted	1.577	50.71	4.454
Dec. 12	.42	.48	.32	.24	Land in beds; saturated; slightly packed.	.184	43.81	.21
Dec. 14–15	1.32	.48	.32	.28	Land in beds; saturated; slightly packed.	.890	67.42	.518
Total yearly	39.87					7.280	18.26	13.50
1941								
Jan. 13	4.42	4.32	2.80	1.68	Bedded; wet, packed	2.501	56.58	14.23
Feb. 22–23	1.29	1.44	.72	.44	do	.135	10.47	.14
Mar. 5, 6	1.48	2.04	1.60	1.04	do	.267	18.04	.45
Mar. 17–18	1.57	.36	.28	.22	Bedded; moist, crusted	.075	4.78	.03
Apr. 2	.95	5.28	3.28	1.88	do	.340	35.79	1.15
Apr. 6	.63	2.16	1.84	1.08	do	.177	28.10	.38
Apr. 21–23	1.41	2.64	1.68	1.64	Bedded; moist, packed	.817	35.06	1.87
Apr. 23–24	.92	3.12	1.20	.68				
Apr. 27	.30	.60	.40	.32	Bedded; very wet and packed.	.015	5.00	.02
Apr. 28	.55	1.20	1.04	.74	do	.113	20.55	.24
May 2	.88	1.56	.92	.78	do	.056	6.36	.05
May 5	.72	3.36	2.48		do	.257	35.69	1.02
May 11	1.05	5.52	3.84	2.10	Cotton planted May 8; loose, moist.	.126	12.00	1.26
May 21	1.13	2.16	1.36	1.04	Cotton 4 inches high; wet; and packed.	.282	24.96	1.02
June 2, 3	1.40	5.76	3.44	2.16	Cotton 5–6 inches high; topsoil dry, subsoil moist.	.347	24.79	1.67
June 3	.94	3.00	1.64	1.34	Cotton 5–6 inches high; wet and packed.	.470	50.00	1.82
June 9–10	1.65	3.12	2.44	1.76	Cotton 5–10 inches high; wet and packed.	.708	42.91	1.82
June 15–16	1.31	4.32	3.28	1.80	Cotton 10–12 inches high; crusted and packed.	.684	52.21	3.00
July 11	2.92	3.12	2.00	1.40	Cotton 30–34 inches high	.189	6.47	.18
Aug. 6–7	2.22	6.60	4.92	3.40	Cotton 38 inches high; topsoil moist, subsoil dry.	.002	.09	.00
Total yearly	43.75					7.561	17.28	30.35

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
1	Area 1/200 acre—6 by 36.3 feet; Land slope, 4 percent; Soil, Austin clay; Cropping practice, continuous corn, rows down slope.	1931		Corn	31.8 bu	23.44	0.734	3.13	4.911
		1932		do	27.3 bu	31.25	4.078	13.05	19.778
		1933		do	24.3 bu	25.68	5.487	21.37	19.890
		1934		do	11.16 bu	29.68	5.410	18.23	33.805
		1935		do	28.57 bu	46.65	9.220	19.76	44.651
		1936		do	32.14 bu	39.85	7.423	18.63	39.338
		1937		do	35.71 bu	28.60	1.290	4.51	4.440
		1938		do	28.26 bu	27.58	2.640	9.57	7.459
		1939		do	29.21 bu	23.77	2.928	12.32	11.085
		1940		do	12.64 bu	39.87	7.350	18.43	9.41
		1941		do	3.57 bu	43.75	10.069	23.01	33.92
		11-year average				32.74	5.148	15.7	20.79
2	Area 1/50 acre—6 by 145.2 feet; Land slope, 4 percent; Soil, Austin clay; Cropping practice, continuous, corn rows down slope.	1931		Corn	31.9 bu	23.44	.720	3.07	1.568
		1932		do	25.8 bu	31.25	3.293	10.54	20.576
		1933		do	26.28 bu	25.68	3.587	13.97	11.848
		1934		do	10.88 bu	29.68	4.555	15.35	27.318
		1935		do	32.50 bu	46.65	7.045	15.10	31.427
		1936		do	28.57 bu	39.85	7.480	18.77	37.647
		1937		do	32.59 bu	28.60	.743	2.598	3.118
		1938		do	25.80 bu	27.58	1.923	6.972	9.418
		1939		do	29.29 bu	23.77	1.556	6.55	6.278
		1940		do	11.58 bu	39.87	6.916	17.35	14.634
		1941		do	21.61 bu	43.75	8.345	19.07	43.56
		11-year average				32.74	4.197	12.8	18.85
3	Area 1/100 acre—6 by 72.6 feet; Land slope, 4 percent; Soil, Austin clay; Cropping practice, continuous corn, rows down slope.	1931		Corn	38.0 bu	23.44	.993	4.236	2.451
		1932		do	28.0 bu	31.25	3.480	11.136	18.957
		1933		do	29.21 bu	25.68	4.824	18.785	14.73
		1934		do	13.84 bu	29.68	4.844	16.320	39.174
		1935		do	33.39 bu	46.65	7.361	15.779	29.140
		1936		do	35.71 bu	39.85	6.457	16.203	38.564
		1937		do	30.36 bu	28.60	1.073	3.752	4.155
		1938		do	31.88 bu	27.58	2.326	8.434	12.615
		1939		do	38.88 bu	23.77	2.716	11.426	14.189
		1940		do	11.97 bu	39.87	6.571	16.481	13.700
		1941		do	26.07 bu	43.75	8.361	19.11	38.75
		11-year average				32.74	4.455	13.6	20.58

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
4	Area 1/100 acre—6 by 72.6 feet Land slope, 4 percent Soil, Austin clay Cropping practice, rotation cotton, corn, oats, rows down slope.	1931		Corn	35.5 bu	23.44	0.537	2.29	0.820
		1932	Oats	Oats	75.4 bu	31.25	.027	.09	.042
		1933		Cotton	335.0 lb. lint	25.68	2.419	9.42	5.19
		1934		Corn	18.08 bu	29.68	3.852	12.98	22.627
		1935	Oats	Oats	45.78 bu	46.65	.093	.199	.354
		1936	Vetch	Cotton	240.0 lb. lint	39.85	7.885	19.79	54.941
		1937	do	Corn	37.5 bu	28.60	1.944	6.797	5.470
		1938	Oats	Oats	67.38 bu	27.58	.072	.261	.070
		1939		Cotton	236.6 lb. lint	23.77	1.958	8.24	7.343
		1940		Corn	13.71 bu	39.87	6.202	15.56	13.650
		1941	Oats	Oats	71.75 bu	43.75	.555	1.27	.33
		11-year average				32.74	2.322	7.10	10.08
5	Area 1/100 acre–6 by 72.6 feet Land slope, 4 percent Soil, Austin clay Cropping practice, rotation cotton, corn, oats. 1931 rows down slope 1932–41 rows on contour	1931		Corn	34.1 bu	23.44	0.231	0.99	0.660
		1932	Oats	Oats	57.25 bu	31.25	.196	.63	.452
		1933		Cotton	361.0 lb. lint	25.68	.877	3.42	3.278
		1934		Corn	14.73 bu	29.68	3.471	11.69	13.677
		1935	Oats	Oats	39.53 bu	46.65	.895	1.92	.802
		1936		Cotton	320.0 lb. lint	39.85	4.470	11.22	15.740
		1937		Corn	29.46 bu	28.60	.853	2.983	2.216
		1938	Oats	Oats	50.38 bu	27.58	.068	0.247	.078
		1939		Cotton	212.9 lb. lint	23.77	.178	.749	.644
		1940		Corn	12.67 bu	39.87	4.553	11.419	5.270
		1941	Oats	Oats	60.81 bu	43.75	1.085	2.48	.39
		11-year average				32.74	1.534	4.70	3.93
6	Area 1/100 acre—6 by 72.6 feet Land slope, 4 percent Soil, Austin clay Cropping practice, continuous Bermuda grass, clipped.	1931	Grass	None	None	23.44	(1)	(1)	(2)
		1932	do	do	do	31.25	(1)	(1)	(2)
		1933	do	do	do	25.68	(1)	(1)	(2)
		1934	do	do	do	29.68	(1)	(1)	(2)
		1935	do	do	do	46.65	.067	.144	.161
		1936	do	do	do	39.85	.010	.025	.014
		1937	do	do	do	28.60	(1)	(1)	(2)
		1938	do	do	do	27.58	.023	.083	.064
		1939	do	do	do	23.77	.002	.008	.010
		1940	do	do	do	39.87	(1)	(1)	(2)
		1941	do	do	do	43.75	.090	.21	.02
		11-year average				32.74	.017	.05	.02

7	Area 1/100 acre—6 by 72.6 feet; Land slope, 4 percent; Soil, Austin clay; Cropping practice, rotation cotton, corn, oats rows down slope.	1931		Cotton	No record	23.44	0.437	1.86	0.981
		1932		Corn	32.1 bu	31.25	3.406	10.899	19.854
		1933	Oats	Oats	19.66 bu	25.68	.316	1.23	.33
		1934		Cotton	250.0 lb. lint	29.68	4.625	15.58	19.255
		1935	Vetch	Corn	35.71 bu	46.65	7.472	16.02	37.462
		1936	Oats	Oats	38.44 bu	39.85	1.288	3.23	3.651
		1937	Vetch	Cotton	344.0 lb. lint	28.60	.990	3.462	5.071
		1938		Corn	33.88 bu	27.58	2.418	8.767	14.321
		1939	Oats	Oats	57.81 bu	23.77	.121	.51	.210
		1940		Cotton	302.2 lb. lint	39.87	5.323	13.35	13.219
		1941		Corn	34.46 bu	43.75	7.462	17.06	26.02
		11-year average				32.74	3.078	9.40	12.76
8	Area 1/100 acre—6 by 72.6 feet; Land slope, 4 percent; Soil, Austin clay; Cropping practice, rotation cotton, corn, oats. 1931 rows on contour; 1932-41 rows down slope	1931		Corn	33.6 bu	23.44	.446	1.90	.716
		1932	Oats	Oats	70.5 bu	31.25	.098	.31	.433
		1933		Cotton	300.0 lb. lint	25.68	2.296	8.941	7.85
		1934		Corn	15.62 bu	29.68	3.550	11.96	15.655
		1935	Oats	Oats	48.75 bu	46.65	.759	1.63	.763
		1936		Cotton	270.0 lb. lint	39.85	7.789	19.55	53.340
		1937		Corn	32.29 bu	28.60	1.993	6.968	6.273
		1938	Oats	Oats	48.25 bu	27.58	.169	.613	.111
		1939		Cotton	262.8 lb. lint	23.77	1.936	8.145	8.131
		1940		Corn	15.18 bu	39.87	7.367	18.48	18.107
		1941	Oats	Oats	66.21 bu	43.75	1.148	2.62	.42
		11-year average				32.74	2.505	7.65	10.16
9	Area 1/100 acre—6 by 72.6 feet; Land slope, 4 percent; Soil, Austin clay; Cropping practice rotation, cotton, corn, oats, rows down slope.	1931	Oats	Oats	No record	23.44	.076	.32	.213
		1932		Cotton	do	31.25	2.240	7.17	9.163
		1933		Corn	26.05 bu	25.68	3.735	14.54	11.530
		1934	Oats	Oats	12.63 bu	29.68	.473	1.59	.992
		1935	Vetch	Cotton	360.0 lb. lint	46.65	6.544	14.03	27.304
		1936		Corn	44.64 bu	39.85	8.617	21.62	52.515
		1937	Oats	Oats	36.25 bu	28.60	1.666	5.825	2.935
		1938		Cotton	340.0 lb. lint	27.58	3.882	14.07	15.978
		1939		Corn	44.89 bu	23.77	2.515	10.58	11.758
		1940	Oats	Oats	21.84 bu	39.87	7.280	18.26	13.50
		1941		Cotton	540.0 lb. lint	43.75	7.561	17.28	30.35
		11-year average				32.74	4.054	12.38	16.02

See footnotes at end of table.

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
10	Area 1/100 acre—6 by 72.6 feet Land slope, 4 percent Soil, Austin clay Cropping practice rotation, cotton, corn, oats, rows on contour.	1931		Corn	30.40 bu	23.44	.256	1.10	0.418
		1932		Oats	63.90 bu	31.25	.031	.10	.049
		1933	Oats Vetch A. W. Peas Vetch	Cotton	311.0 lb. lint	25.68	.672	2.62	.82
		1934		Corn	15.51 bu	29.68	2.907	9.79	6.668
		1935	Oats	Oats	57.34 bu	46.65	.015	.03	.095
		1936	Vetch	Cotton	345.0 lb. lint	39.85	4.577	11.49	11.101
		1937		Corn	26.80 bu	28.60	1.292	4.517	1.969
		1938	Oats	Oats	62.50 bu	27.58	.090	.326	.035
		1939		Cotton	332.9 lb. lint	23.77	.239	1.00	.642
		1940		Corn	12.74 bu	39.87	5.838	14.64	7.370
		1941	Oats	Oats	27.03 bu	43.75	1.678	3.84	.34
		11-year average				32.74	1.600	4.89	2.68
11	Area 1/100 acre—6 by 72.6 feet Land slope, 4 percent Soil, Austin clay; top 15 inches removed Cropping practice rotation, cotton, corn, oats, rows down slope.	1931		Corn	5.70 bu	23.44	.306	1.31	.327
		1932	Oats	Oats	23.06 bu	31.25	.653	2.09	1.284
		1933		Cotton	93.0 lb. lint	25.68	5.72	21.31	30.41
		1934		Corn	0.00 bu	29.68	3.930	13.24	11.696
		1935	Oats	Oats	21.87 bu	46.65	9.508	20.38	7.103
		1936		Cotton	110.0 lb. lint	39.85	9.626	24.16	60.079
		1937		Corn	12.05 bu	28.60	2.975	10.402	10.338
		1938	Oats	Oats	29.51 bu	27.58	5.436	19.71	4.516
		1939		Cotton	122.2 lb. lint	23.77	2.958	12.44	15.439
		1940		Corn	6.31 bu	39.87	10.749	26.960	18.961
		1941	Oats	Oats	22.44 bu	43.75	11.469	26.21	7.21
		11-year average				32.74	5.735	17.52	15.22

12	Area 0.0463 acre, 12 by 168 feet Land slope, 3½ percent Soil, Austin clay Cropping practice, strip-cropped beginning at bottom of plot. 24-foot resistant crop 60-foot cotton 24-foot resistant crop 60-foot cotton rows on contour.	1932		Cotton	(3)	20.48	(1)	(1)	(2)
				Cane	(3)				
		1933		Cotton	(3)	25.68	(1)	(1)	(2)
				Sudan	(3)				
		1934		Cotton	(3)	29.68	(1)	(1)	(2)
			Oats	Oats	(3)				
		1935		Cotton	317.0 lb. lint	46.65	.237	.508	.072
			Oats	Oats	41.95 bu.				
		1936		Cotton	217.0 lb. lint	39.85	1.310	3.29	3.31
				Cane	(3)				
		1937		Cotton	211.8 lb. lint	28.60	.147	.513	.306
				Sudan	3.31 tons hay				
		1938		Cotton	240.91 lb. lint	27.58	.177	.641	.187
			Oats	Oats	64.51 bu.				
		1939		Cotton	202.85 lb. lint	23.77	.155	.652	.704
				Cane	5.49 tons hay				
		1940		Cotton	252.3 lb. lint	39.87	.529	1.33	.666
				Sudan	2.88 tons hay				
		1941		Cotton	324.24 lb. lint	43.75	.253	.58	.19
			Oats	Oats	60.63 bu.				
	Data from Apr. 28, 1932, to Dec. 31, 1941	9.67-year average				33.70	.290	.86	.56
13	Area 0.0847 acre 22 x 168 feet Land slope, 3½ percent Soil Austin clay Cropping practice, continuous cotton rows on contour.	1932		Cotton	(3)	20.48	1.582	7.724	3.70
		1933		do	(3)	25.68	1.656	6.448	1.79
		1934		do	(3)	29.68	.027	.090	.17
		1935		do	282.0 lb. lint	46.65	3.843	8.238	14.612
		1936		do	222.0 lb. lint	39.85	3.940	9.89	18.696
		1937		do	218.06 lb. lint	28.60	.042	.147	.122
		1938		do	250.18 lb. lint	27.58	1.636	5.932	8.792
		1939		do	210.41 lb. lint	23.77	.695	2.92	2.400
		1940		do	213.31 lb. lint	39.87	.214	.54	.622
		1941		do	319.95 lb. lint	43.75	1.518	3.47	6.07
	Data from Apr. 28, 1932, to Dec. 31, 1941	9.67-year average				33.70	1.567	4.65	5.89
14	Area 0.0309 acre, 8 x 168 feet Land slope, 3½ percent Soil, Austin clay Cropping practice, continuous cotton rows down slope.	1932		Cotton	(3)	20.48	.821	4.009	13.690
		1933		do	(3)	25.68	4.084	15.903	6.43
		1934		do	(3)	29.68	5.247	17.678	13.377
		1935		do	226.0 lb. lint	46.65	7.522	16.124	23.874
		1936		do	230.0 lb. lint	39.85	7.690	19.30	31,689
		1937		do	301.64 lb. lint	28.60	.255	.892	.358
		1938		do	226.86 lb. lint	27.58	3.120	11.31	11.992
		1939		do	186.96 lb. lint	23.77	2.261	9.51	7.268
		1940		do	206.9 lb. lint	39.87	6.065	15.21	13.992
		1941		do	288.03 lb. lint	43.75	7.293	16.67	29.23
	Data from Apr. 28, 1932, to Dec. 31, 1941	9.67-year average				33.70	4.587	13.6	15.71

See footnotes at end of table.

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
15	Area 0.0847 acre, 22 by 168 feet Land slope, 3½ percent Soil, Austin clay Cropping practice, strip-cropped beginning at bottom of plot. 24 feet resistant crop 60 feet cotton 24 feet resistant crop 60 feet cotton rows on contour.	1932		Cotton Cane	(3) (3)	20.48	(1)	(1)	(2)
		1933	Oats	Cotton Oats	(3) (3)	25.68	(1)	(1)	(2)
		1934		Cotton Guar	(3) (3)	29.68	.023	.077	.30
		1935		Cotton Sudan	204.0 lb. lint (3)	46.65	2.023	4.337	1.864
		1936	Oats	Cotton Oats	225.0 lb. lint 46.48 bu	39.85	1.435	3.60	1.343
		1937		Cotton Sudan	261.58 lb. lint 3.2 tons hay	28.60	.283	.990	.618
		1938		Cotton Cane	220.82 lb. lint 5.85 tons hay	27.58	1.236	4.482	2.719
		1939	Oats	Cotton Oats	186.43 lb. lint 24.94 bu	23.77	.045	.19	.024
		1940		Cotton Cane	207.0 lb. lint 5.71 tons hay	39.87	.165	.41	.177
		1941		Cotton Sudan	286.85 lb. lint 3.2 tons hay	43.75	.789	1.80	1.67
	Data from Apr. 28, 1932 to Dec. 31, 1941	9.67-year average				33.70	.620	1.8	.90
16	Area 0.0503 acre, 13 feet by 168 feet Land slope, 3½ percent Soil, Austin clay Cropping practice, strip-cropped beginning at bottom of plot. 24 feet resistant crop 60 feet cotton 24 feet resistant crop 60 feet cotton rows on contour.	1932		Cotton Sudan	(3) (3)	20.48	(1)	(1)	(2)
		1933	Oats	Cotton Oats	(3) (3)	25.68	(1)	(1)	(2)
		1934		Cotton Sudan	(3) (3)	29.68	.081	.273	.17
		1935		Cotton Cane	220.0 lb. lint (3)	46.65	1.135	2.433	.933
		1936		Cotton Sudan	221.0 lb. lint (3)	39.85	1.077	2.702	.577
		1937	Oats	Cotton Oats	438.22 lb. lint 22.36 bu	28.60	.142	.497	.093
		1938		Cotton Sudan	216.76 lb. lint 4.69 tons hay	27.58	.754	2.734	1.404
		1939		Cotton Sudan	189.36 lb. lint 2.72 tons hay	23.77	.094	.40	.207
		1940	Oats	Cotton Oats	245.0 lb. lint 13.86 bu	39.87	.477	1.20	.644
		1941		Cotton Cane	310.06 lb. lint 5.6 tons hay	43.75	.745	1.70	1.60
	Data from Apr. 28, 1932 to Dec. 31, 1942	9.67-year average				33.70	.466	1.38	.58

17	Area 0.0505 acre, 17 by 129.5 feet Land slope, 2 percent Soil, Houston black clay Cropping practice strip-cropped beginning at bottom of plot 30 feet resistant crop 99.5 feet cotton rows on contour.	1933	Vetch	Cotton Cane	(3) (3)	25.18	1.201	4.770	.7
		1934	Vetch	Cotton Sudan	176.39 lb. lint (3)	30.10	.317	1.053	.54
		1935	Vetch	Cotton Sudan	163.84 lb. lint (3)	45.30	5.168	11.408	2.549
		1936	Vetch	Cotton Sudan	160.0 lb. lint (3)	39.01	2.333	5.98	.850
		1937	Vetch	Cotton Sudan	327.17 lb. lint 3.69 tons hay	29.20	.952	3.260	.594
		1938	Oats	Cotton Oats	291.54 lb. lint 78.47 bu	27.55	.859	3.118	.324
		1939		Cotton Cane	265.69 lb. lint 1.15 tons hay	24.41	.389	1.59	.203
		1940		Cotton Sudan	332.6 lb. lint 2.09 tons hay	39.86	.590	1.48	.353
		1941	Oats	Cotton Oats	302.56 lb. lint 22.64 bu	43.35	1.254	2.89	.42
		9-year average				33.77	1.451	4.30	.73
18	Area 0.0286 acre, 9 by 138.35 feet Land slope, 2 percent Soil, Houston black clay Cropping practice, continuous Bermuda grass, clipped.	1933	Grass	None	Bone	25.18	(1)	(1)	(2)
		1934	do	do	do	30.10	(1)	(1)	(2)
		1935	do	do	do	45.30	1.330	2.936	0.407
		1936	do	do	do	29.20	(1)	(1)	(2)
		1937	do	do	do	29.20	(1)	(1)	(2)
		1938	do	do	do	27.55	.172	.624	.017
		1939	do	do	do	24.41	(1)	(1)	(2)
		1940	do	do	do	39.86	(1)	(1)	(2)
		1941	do	do	do	43.35	2.247	5.18	.29
		9-year average				33.77	.417	1.2	.08
19	Area 0.0286 acre, 9 by 138.35 feet Land slope, 2 percent Soil, Houston black clay Cropping practice, 3-year rotation cotton, corn, oats, rows down slope.	1933		Cotton	No record	25.18	1.502	5.965	2.786
		1934		Corn	21.94 bu	30.10	2.590	8.604	7.439
		1935	Oats	Oats	41.98 bu	45.30	1.088	2.402	.762
		1936		Cotton	412.76 lb. lint	39.01	6.192	15.87	17.150
		1937		Corn	36.85 bu	29.20	.843	2.886	1.135
		1938	Oats	Oats	70.61 bu	27.55	.095	.345	.055
		1939		Cotton	229.83 lb. lint	24.41	1.431	5.862	2.151
		1940		Corn	33.51 bu	39.86	2.860	7.175	3.684
		1941	Oats	Oats	45.99 bu	43.35	.862	1.99	.36
		9-year average				33.77	1.940	5.74	3.95
20	Area 0.0286 acre, 9 by 138.35 feet Land slope, 2 percent Soil, Houston black clay Cropping practice, 3-year rotation cotton, corn, oats, rows down slope.	1933		Corn	27.21 bu	25.18	2.628	10.437	2.865
		1934	Oats	Oats	28.44 bu	30.10	.892	2.963	1.17
		1935		Cotton	734.6 lb. lint	45.30	6.750	14.900	11.538
		1936		Corn	49.35 bu	39.01	5.706	14.63	13.630
		1937	Oats	Oats	49.67 bu	29.20	.201	.688	.427
		1938		Cotton	288.81 lb. lint	27.55	3.372	12.24	8.950
		1939		Corn	38.02 bu	24.41	.990	4.06	1.070
		1940	Oats	Oats	19.85 bu	39.86	4.028	10.11	2.379
		1941		Cotton	300.70 lb. lint	43.35	5.961	13.75	9.96
		9-year average				33.77	3.392	10.04	5.78

See footnotes at end of table.

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
21	Area 0.0286 acre, 9 by 138.35 feet; Land slope, 2 percent; Soil, Houston black clay; Cropping practice, 3-year rotation cotton, corn, oats, rows down slope.	1933	Oats	Oats	16.43 bu	25.18	1.723	6.84	2.20
		1934		Cotton	253.6 lb. lint	30.10	3.925	13.04	12.337
		1935		Corn	42.66 bu	45.30	9.090	20.07	17.004
		1936	Oats	Oats	40.0 bu	39.01	2.001	5.129	1.119
		1937		Cotton	473.63 lb. lint	29.20	.300	1.027	.371
		1938		Corn	49.23 bu	27.55	2.503	9.085	6.364
		1939	Oats	Oats	53.91 bu	24.41	(1)	(1)	(2)
		1940		Cotton	234.3 lb. lint	39.86	4.344	10.898	3.843
		1941		Corn	35.78 bu	43.35	5.503	12.69	11.69
		9-year average				33.77	3.265	9.67	6.10
22	Area 0.0286 acre, 9 by 138.35 feet; Land slope, 2 percent; Soil Houston black clay; Cropping practice, continuous corn, rows down slope.	1933		Corn	25.92 bu	25.18	2.863	11.370	5.08
		1934		do	19.48 bu	30.10	3.123	10.375	6.129
		1935		do	32.73 bu	45.30	6.248	13.792	12.412
		1936		do	38.72 bu	39.01	6.451	16.636	18.870
		1937		do	35.29 bu	29.20	.477	1.633	.869
		1938		do	34.30 bu	27.55	2.562	9.299	7.443
		1939		do	28.98 bu	24.41	1.017	4.17	1.369
		1940		do	30.59 bu	39.86	4.466	11.204	4.871
		1941		do	23.79 bu	43.35	5.507	12.70	13.47
		9-year average				33.77	3.635	10.76	7.83
23	Area 1.38 acres; Land slope, 4–6 percent; Soil, Houston clay; Cropping practice, strip-cropped; Cotton and oats rotated and alternated, strips approximately 75 feet in width, rows on contour. Data from July 30, 1933 to Dec. 31, 1938.	1933	Oats	Cotton	(3)				
				Oats	(3)	11.72	.141	1.203	.41
		1934	do	Cotton	(3)				
				Oats	(3)	27.95	2.296	8.215	9.604
		1935	do	Cotton	67.84 lb. lint				
				Oats	14.03 bu	45.01	5.172	11.491	2.659
		1936	Vetch	Cotton	107.62 lb. lint				
				Oats	33.71 bu	41.44	(3)	(3)	19.495
		1937	do	Cotton	254.81 lb. lint				
				Oats	39.87 bu	28.79	(3)	(3)	1.642
		1938	Oats	Cotton	186.56 lb. lint				
				Oats	61.10 bu	26.65	(3)	(3)	2.134
		5.5-year average				33.01			6.54
24	Area 1.37 acres, 9 feet 2 inches by 311 feet 2 inches; Land slope, 4–6 percent; Soil, Houston clay; Cropping practice, continuous cotton, rows down slope. Data from July 30, 1933, to Dec. 31, 1938.	1933		Cotton	(3)	11.72	1.097	9.360	4.178
		1934		do	(3)	27.95	4.201	15.030	29.833
		1935		do	109.5 lb. lint	45.01	11.273	25.045	104.576
		1936		do	116.73 lb. lint	41.44	13.783	33.26	99.168
		1937		do	71.98 lb. lint	28.79	(3)	(3)	20.854
		1938		do	69.64 lb. lint	26.65	(3)	(3)	34.788
		5.5-year average				33.01			53.34

25	Area, 1.39 acres	1933		Cotton	(3)	11.72	1.520	12.969	7.75
	Land slope, 4-6 percent	1934		do	(3)	27.95	3.017	10.787	31.262
	Soil, Houston clay	1935		do	50.3 lb. lint	45.01	12.055	26.794	87.360
	Cropping practice, continuous cotton, rows on contour.	1936		do	68.74 lb. lint	41.44	(3)	(3)	98.059
		1937		do	87.15 lb. lint	28.79	(3)	(3)	14.936
		1938		do	81.83 lb. lint	26.65	(3)	(3)	36.014
	Data from July 30, 1933 to Dec. 31, 1938	5.5-year average				33.01			50.07
Plot F	Area, 2.227 acres 175 by 554.3 feet	1933		Corn	24.6 bu	25.27	.231	.91	.21
	Land slope, 2.5 percent	1934		Cotton	369.6 lb. s. cat	29.42	3.816	12.97	5.21
	Soil, 80 percent Houston black clay, 20 percent Bell clay.	1935	Oats	Oats	40.9 bu	46.44	6.078	[4,5,6] 13.09	2.60
		1936		Cotton	384.4 lb. s. cat	40.85	9.181	[7] 22.47	[7] 8.93
	Rows on contour	1937		Corn	33.3 bu	29.23	1.015	3.47	.12
	Crop sequence, cotton, corn, cotton, oats	1938		Cotton	325.1 lb. s. cat	28.27	5.385	19.05	7.60
		1939	Oats	Oats	72.2 bu	19.41	.043	.22	trace
	Data from January 1933 to Nov. 1, 1939	6.8-year average				32.19	3.787	11.76	3.63
Plot G	Area, 2.226 acres 175 by 554.3 feet	1933		Corn	19.7 bu	25.27	.622	2.46	.39
	Land slope, 2.5 percent	1934		Cotton	333.3 lb. s. cat	29.47	3.196	10.84	5.10
	Soil, 87 percent Houton black clay, 13 percent Bell clay.	1935	Oats	Oats	43.8 bu	46.35	8.696	[4,5,6] 18.76	2.88
		1936		Cotton	172.5 lb. s. cat	40.80	8.916	[7] 21.85	[7] 11.64
	Rows down slope	1937		Corn	35.5 bu	29.28	2.412	8.24	.44
	Crop sequence, cotton, corn, cotton, oats	1938		Cotton	180.6 lb. s. cat	28.37	6.101	21.51	6.80
		1939	Oats	Oats	72.2 bu	19.41	.092	.47	trace
	Data from January 1933 to November 1939	6.8-year average				32.20	4.417	13.72	4.01
Terrace A-13	Area, 1.396 acres	1931	Oats	Oats	(3)	26.41	.139	.53	.02
	Length, 892 feet	1932		Corn	37.3 bu	35.05	1.079	3.08	.65
	Vertical interval, 2 feet	1933		Cotton	355.0 lb. s. cat	23.98	1.160	4.84	.70
	Grade, 3 inches per 100 feet	1934	Oats	Oats	34.9 bu	28.85	1.261	4.37	.46
	Land slope, 3.1 percent	1935	do	do	39.7 bu	44.67	5.273	11.80	1.48
	Soil, 45 percent Houston black clay, 55 percent Houston clay.	1936		Corn	24.6 bu	39.23	7.697	19.62	3.36
		1937		Cotton	349.0 lb. s. cat	29.64	1.748	5.90	.56
	Crop sequence, corn, oats, corn, cotton	1938		Corn	18.7 bu	28.47	4.009	14.08	1.12
	Data from January 1931 to Dec. 31, 1938	8-year average				32.04	2.796	8.73	1.04
Terrace A-14	Area, 1.281 acres	1931		Cotton	263.0 lb. s. cat	26.41	.360	1.36	.07
	Length, 897 feet	1932	Oats	Oats	30.1 bu	35.05	.300	.86	.05
	Vertical interval, 1.7 feet	1933		Corn	14.7 bu	23.98	.372	1.55	(8)
	Grade, 3 inches per 100 feet	1934		Cotton	348.9 lb. s. cat	28.85	2.868	9.94	2.13
	Land slope, 2.6 percent	1935		do	156.1 lb. s. cat	44.67	9.713	[4] 21.74	6.16
	Soil, 38 percent Houston black clay, 62 percent Houston clay.	1936	Oats	Oats	31.4 bu	39.23	7.458	19.01	1.66
		1937		Corn	27.5 bu	29.64	2.223	7.50	.41
	Crop sequence, cotton, oats, corn, oats	1938	Oats	Oats	27.8 bu	28.47	4.192	14.72	.46
	Data from January 1931 to Dec. 31, 1938	8-year average				32.04	3.436	10.72	1.37

See footnotes at end of table.

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
Terrace A-15	Area, 1.237 acres	1931		Corn	18.1 bu	26.41	.890	3.37	.66
	Length, 905 feet	1932		Cotton	234.0 lb. s. cat	35.05	1.789	5.10	1.82
	Vertical interval, 2.3 feet	1933	Oats	Oats	4.2 bu	23.99	1.540	6.42	1.51
	Grade, 3 inches per 100 feet	1934		Cotton	158.5 lb. s. cat	28.86	5.598	19.40	4.28
	Land slope, 3.6 percent	1935		Corn	25.9 bu	44.68	14.938	[5] 33.43	12.68
	Soil, 20 percent Houston black clay, 80 percent Houston clay	1936		Cotton	165.7 lb. s. cat	39.23	10.796	[5] 27.52	5.07
	Crop sequence, cotton, corn, cotton, oats	1937	Oats	Oats	32.3 bu	29.63	2.564	8.65	1.49
		1938		Cotton	405.01 lb. s. cat	28.47	5.228	18.36	2.40
		1939		Corn	36.1 bu	18.68	.024	.13	.01
	Data from January 1931 to Nov. 1, 1939	8.8-year average				31.25	4.928	15.77	3.40
Terrace A-16	Area, 1.739 acres	1931		Corn	17.6 bu	26.37	.550	2.08	.46
	Length, 896 feet	1932		Cotton	177.0 lb. s. cat	35.07	1.403	4.00	.82
	Vertical interval, 3 feet	1933	Oats	Oats	4.7 bu	24.17	1.300	5.38	1.17
	Grade, 3 inches per 100 feet	1934		Cotton	125.9 lb. s. cat	28.96	2.845	9.82	2.16
	Land slope, 3.1 percent	1935		Corn	22.9 bu	44.93	7.408	16.49	5.69
	Soil, 50 percent Houston black clay, 50 percent Houston clay	1936		Cotton	182.3 lb. s. cat	39.35	6.919	17.58	3.10
	Crop sequence, cotton, corn, cotton, oats	1937	Oats	Oats	38.8 bu	29.58	1.447	4.89	.69
		1938		Cotton	364.6 lb. s. cat	28.39	4.411	15.54	2.77
		1939		Corn	38.6 bu	18.68	.004	.02	[8]
	Data from January 1931 to Nov. 1, 1939	8.8-year average				31.31	2.987	9.54	1.92
Terrace A-17	Area, 2.066 acres	1931		Corn	15.5 bu	26.37	[4]	[4]	.28
	Length, 749 feet	1932		Cotton	854.0 lb. s. cat	35.07	1.020	2.91	1.70
	Vertical interval, 4 feet	1933	Oats	Oats	6.04 bu	24.12	1.150	4.77	1.51
	Grade, 3 inches per 100 feet	1934		Cotton	118.6 lb. s. cat	28.93	4.628	16.00	6.91
	Land slope, 3.1 percent	1935		Corn	25.04 bu	44.86	14.143	31.53	16.16
	Soil, 80 percent Houston black clay, 20 percent Houston clay	1936		Cotton	141.3 lb. s. cat	39.32	9.312	23.68	8.36
	Crop sequence, cotton, corn, cotton, oats	1937	Oats	Oats	41.4 bu	29.59	1.271	4.29	1.84
		1938		Cotton	345.6 lb. s. cat	28.42	5.085	17.89	4.94
		1939		Corn	41.8 bu	18.68	.032	.17	.01
	Data from January 1931 to Nov. 1, 1939	8.8-year average				31.29	4.164	13.31	4.74

Terrace A-18	Area, 1.136 acres	1931		Cotton	273.3 lb. s. cat	26.46	[8]	[8]	[8]
	Length, 625 feet	1932	Oats	Oats	39.3 bu	35.05		0	0
	Vertical interval, 2.6 feet	1933		Cotton	402.4 lb. s. cat	24.01	1.290	[6] 5.37	.57
	Grade, 1 inch per 100 feet	1934		Corn	20.1 bu	28.87	2.910	10.08	1.64
	Land slope, 3.2 percent	1935		Cotton	280.8 lb. s. cat	44.70	4.823	[4, 6] 10.79	3.01
	Soil, 100 percent Houston black clay	1936	Oats	Oats	46.9 bu	39.25	2.179	5.55	.88
	Crop sequence, cotton, corn, cotton, oats	1937		Cotton	346.0 lb. s. cat	29.63	.668	2.25	.26
		1938		Corn	20.9 bu	28.46	1.934	[6] 6.80	.56
		1939		Cotton	435.7 lb. s. cat	18.68	.034	.18	.02
	Data from January 1931 to Nov. 1, 1939	8.8-year average				31.26	1.573	5.03	.79
Terrace A-19	Area, 1.545 acres	1931		Cotton	324.1 lb. s. cat	26.32	.071	.27	.03
	Length, 625 feet	1932	Oats	Oats	53.6 bu	35.08	.085	.24	[8]
	Vertical interval, 2.8 feet	1933		Cotton	435.1 lb. s. cat	24.34	.424	1.74	.20
	Grade, 1 inch per 100 feet	1934		Corn	19.2 bu	29.06	1.917	[6] 6.60	1.19
	Land slope, 2.6 percent	1935		Cotton	183.8 lb. s. cat	45.14	9.287	20.57	6.04
	Soil, 100 percent Houston black clay	1936	Oats	Oats	43.7 bu	39.45	4.297	10.89	.79
	Crop sequence, cotton, corn, cotton, oats	1937		Cotton	338.0 lb. s. cat	29.52	.623	2.11	.29
		1938		Corn	25.3 bu	28.33	2.774	9.79	.93
	Data from January 1931, to Dec. 31, 1938	8-year average				32.16	2.435	7.57	1.18
Terrace A-20	Area, 1.898 acres	1931		Cotton	356.7 lb. s. cat	26.27	.369	1.40	.09
	Length, 625 feet	1932	Oats	Oats	54.0 bu	35.13	.062	.18	[8]
	Vertical interval, 2.7 feet	1933		Cotton	611.5 lb. s. cat	24.54	1.462	5.96	.80
	Grade, 1 inch per 100 feet	1934		Corn	7.3 bu	29.17	3.349	11.48	3.86
	Land slope, 2 percent	1935		Cotton	118.9 lb. s. cat	45.42	13.649	30.05	10.64
	Soil, 100 percent Houston black clay	1936	Oats	Oats	44.2 bu	39.57	4.680	11.83	.99
	Crop sequence, cotton, corn, cotton, oats	1937		Cotton	234.0 lb. s. cat	29.45	1.024	3.48	.84
		1938		Corn	24.2 bu	28.25	4.136	14.64	1.86
	Data from January 1931, to Dec. 31, 1938	8-year average				32.23	3.591	11.14	2.39
Terrace B-3	Area, 1.354 acres	1932		Corn	25.4 bu	35.22	.378	1.07	.07
	Length, 847 feet	1933		Cotton	424.0 lb. s. cat	25.83	.990	3.83	.37
	Vertical interval, 3 feet	1934	Oats	Oats	40.9 bu	29.92	3.092	10.33	1.38
	Grade, level	1935		Cotton	120.0 lb. s. cat	47.10	6.729	14.29	3.32
	Land slope, 4 percent	1936		Corn	28.9 bu	40.34	4.728	11.72	1.57
	Soil, 100 percent Houston black clay	1937		Cotton	298.4 lb. s. cat	29.02	.566	1.95	.15
	Crop sequence, cotton, corn, cotton, oats	1938	Oats	Oats	55.9 bu	27.76	.566	2.04	.05
		1939		Corn	41.1 bu	19.41	.074	.38	.20
	Data from January 1932, to Nov. 1, 1939	7.8-year average				32.64	2.195	6.72	.89
Terrace B-4	Area, 1.016 acres	1934	Oats	Oats	45.5 bu	29.92	1.488	4.97	.52
	Length, 938 feet	1935		Cotton	135.0 lb. s. cat	47.10	10.947	23.24	6.24
	Vertical interval, 2 feet	1936		Corn	29.5 bu	40.34	7.503	18.60	2.09
	Grade, level	1937		Cotton	207.7 lb. s. cat	29.02	.685	2.36	.18
	Land slope, 4 percent	1938	Oats	Oats	45.6 bu	27.76	1.079	3.89	.06
	Soil, 100 percent Houston black clay	1939		Corn	30.4 bu	19.41	.070	.36	.02
	Crop sequence, cotton, corn, cotton, oats								
	Data from January 1934 to Nov. 1, 1939	5.8-year average				33.37	3.754	11.25	1.57

See footnotes at end of table.

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
Terrace C-7	Area, 1.831 acres; Length, 828 feet; Vertical interval, 5 feet; Grade, 3 inches per 100 feet; Land slope, 5.4 percent; Soil, 41 percent Houston black clay, 59 percent Austin clay; Crop sequence, cotton, corn, cotton, oats	1931		Corn	18.3 bu	24.73	.130	.53	.19
		1932		Cotton	468.0 lb. s. cat	33.28	1.811	5.44	2.02
		1933	Oats	Oats	6.45 bu	25.29	1.920	7.59	2.29
		1934		Cotton	155.1 lb. s. cat	29.69	1.384	4.66	3.01
		1935		Corn	20.7 bu	45.96	9.676	21.05	11.53
		1936		Cotton	320.0 lb. s. cat	40.57	9.137	22.52	9.97
		1937	Oats	Oats	41.5 bu	29.49	.682	2.31	1.44
		1938		Cotton	323.3 lb. s. cat	28.79	5.348	18.58	6.34
		1939		Corn	28.1 bu	22.22	.181	.81	.05
		1940		Cotton	381.0 lb s. cat	40.94	5.942	14.51	4.28
		1941	Oats	Oats	38.3 bu	40.58	4.143	10.21	1.27
	Data from January 1931 to December 1941.	11-year average				32.87	3.669	11.16	3.85
Terrace C-6	Area, 1.473 acres; Length, 844 feet; Vertical interval, 4 feet; Grade, 3 inches per 100 feet; Land slope, 5.4 percent; Soil, 30 percent Houston black clay, 70 percent Austin clay; Corn sequence, cotton, corn, cotton, oats	1931		Corn	18.7 bu	24.69	[4]	[4]	.02
		1932		Cotton	259.0 lb. s. cat	33.18	1.515	4.57	.74
		1933	Oats	Oats	5.7 bu	25.30	2.320	9.17	1.85
		1934		Cotton	128.3 lb. s. cat	29.69	1.355	[4] 4.56	2.87
		1935		Corn	20.7 bu	45.91	7.692	16.75	7.66
		1936		Cotton	383.6 lb. s. cat	40.53	8.573	21.15	5.58
		1937	Oats	Oats	36.7 bu	29.51	1.141	3.87	1.23
		1938		Cotton	274.9 lb. s. cat	28.85	3.406	11.81	3.68
		1939		Corn	27.4 bu	22.22	.058	.26	.02
		1940		Cotton	395.0 lb. s. cat	40.94	7.112	17.37	3.54
		1941	Oats	Oats	34.7 bu	40.58	4.522	11.14	1.03
	Data from January 1931 to December 1941.	11-year average				32.85	3.427	10.43	2.57
Terrace C-5	Area, 1.044 acres; Length, 850 feet; Vertical interval, 3 feet; Grade, 3 inches per 100 feet; Land slope, 5.4 percent; Soil, 40 percent Houston black clay, 60 percent Austin clay; Crop sequence, cotton, corn, cotton, oats	1931		Corn	14.7 bu	24.65	.301	1.22	.10
		1932		Cotton	227.0 lb. s. cat	33.12	.956	[6] 2.89	1.38
		1933	Oats	Oats	5.8 bu	25.29	2.220	8.78	1.79
		1934		Cotton	138.9 lb. s. cat	29.75	1.244	4.18	2.62
		1935		Corn	16.6 bu	45.87	7.584	16.53	6.26
		1936		Cotton	320.9 lb. s. cat	40.51	8.488	20.95	4.59
		1937	Oats	Oats	34.8 bu	29.53	1.790	6.06	.58
		1938		Cotton	350.0 lb. s. cat	28.89	3.468	12.00	1.85
		1939		Corn	20.2 bu	22.22	.067	.30	.02
		1940		Cotton	408.0 lb. s. cat	40.94	7.760	18.95	3.07
		1941	Oats	Oats	25.9 bu	40.58	6.054	14.92	1.38
	Data from January 1931 to December 1941.	11-year average				32.85	3.630	11.05	2.15

Terrace C-13	Area, 3.937 acres	1932		Cotton	153.0 lb. s. cat	33.57	2.073	[6] 6.17	.96
	Length, 1930 feet	1933	Oats	Oats	6.5 bu	25.51	2.333	9.14	1.86
	Vertical interval, 3.9 feet	1934		Cotton	176.3 lb s. cat	29.57	2.555	8.64	2.53
	Grade, 0-3 inches per 100 feet, variable	1935		Corn	18.2 bu	46.42	9.109	19.62	6.49
	Land slope, 4.4 percent	1936		Cotton	404.1 lb. s. cat	40.80	8.775	21.51	2.44
	Soil, 51 percent Houston black clay,	1937	Oats	Oats	34.3 bu	29.19	1.612	5.52	.53
	49 percent Austin clay	1938		Cotton	254.5 lb. s. cat	28.33	3.019	10.66	1.75
	Crop sequence, cotton, corn, cotton, oats	1939		Corn	28.4 bu	22.68	.045	.20	.01
	Data from January 1932 to Dec. 31, 1939	8-year average				32.01	3.690	11.53	2.07
Terrace C-14	Area, 4.047 acres	1932		Cotton	198.0 lb. s. cat	33.59	1.986	5.91	1.45
	Length, 1,875 feet	1933	Oats	Oats	8.6 bu	25.52	2.461	9.64	2.05
	Vertical interval, 3.4 feet	1934		Cotton	211.3 lb. s. cat	29.57	.707	[9] 2.39	.57
	Grade, 3 inches per 100 feet	1935		Corn	19.3 bu	46.44	11.268	[5] 24.26	9.78
	Land slope, 4.1 percent	1936		Cotton	231.5 lb. s. cat	40.83	7.075	17.33	4.67
	Soil, 64 percent Houston black clay,	1937	Oats	Oats	32.3 bu	29.16	1.158	3.97	.68
	36 percent Austin clay	1938		Cotton	270.1 lb s. cat	28.30	4.866	17.19	2.83
	Crop sequence, cotton, corn, cotton, oats	1939		Corn	28.6 bu	22.68	.077	.34	.01
	Data from January 1932 to Dec. 31, 1939	8-year average				32.01	3.700	11.56	2.76
Terrace C-15	Area, 3.443 acres	1932		Cotton	165.0 lb s. cat	33.62	1.389	4.13	.77
	Length, 1,856 feet	1933	Oats	Oats	9.3 bu	25.52	1.950	7.64	1.53
	Vertical interval, 2.8 feet	1934		Cotton	178.9 lb s. cat	29.57	1.874	6.34	1.89
	Grade, 4 inches per 100 feet	1935		Corn	22.8 bu	46.44	10.048	21.64	7.58
	Land slope, 3.6 percent	1936		Cotton	297.7 lb s. cat	40.82	9.411	23.05	5.38
	Soil, 85 percent Houston black clay,	1937	Oats	Oats	37.9 bu	29.17	1.987	6.81	.63
	15 percent Austin clay	1938		Cotton	362.2 lb. s. cat	28.30	4.527	16.00	2.35
	Crop sequence, cotton, corn, cotton, oats	1939		Corn	34.5 bu	22.68	.090	.40	.01
	Data from January 1932 to Dec. 31, 1939	8-year average				32.02	3.910	12.21	2.52
Terrace C-16	Area, 3.960 acres	1932		Cotton	244.0 lb. s. cat	33.67	1.550	4.60	[7,8] .22
	Length, 1,870 feet	1933	Oats	Oats	12.0 bu	25.49	1.950	7.65	1.55
	Vertical interval, 2.8 feet	1934		Cotton	270.9 lb. s. cat	29.54	1.693	5.73	1.65
	Grade, 5 inches per 100 feet	1935		Corn	26.0 bu	46.45	8.725	[4] 18.78	6.73
	Land slope, 3.1 percent	1936		Cotton	188.0 lb. s. cat	40.83	8.558	20.96	4.18
	Soil, 92 percent Houston black clay,	1937	Oats	Oats	38.6 bu	29.18	1.630	[6] 5.59	.43
	8 percent Austin clay	1938		Cotton	355.3 lb. s. cat	28.30	4.469	15.79	3.08
	Crop sequence, cotton, corn, cotton, oats	1939		Corn	30.9 bu	22.68	.208	.92	.10
	Data from January 1932 to Dec. 31. 1939	8-year average				32.02	3.598	11.24	2.24
Terrace C-17	Area, 3.778 acres	1932		Cotton	339.0 lb. s. cat	33.78	1.463	4.33	1.61
	Length, 1,890 feet	1933	Oats	Oats	11.8 bu	25.34	1.460	5.76	1.03
	Vertical interval, 2.9 feet	1934		Cotton	352.6 lb. s. cat	29.57	1.688	5.71	1.22
	Grade, 0-5 inches per 100 feet, variable	1935		Corn	30.0 bu	46.23	11.908	25.76	6.91
	Land slope, 3.2 percent	1936		Cotton	464.8 lb. s. cat	40.73	6.683	16.41	4.20
	Soil, 96 percent Houston black clay, 4 percent Austin clay.	1937	Oats	Oats	53.6 bu	29.33	1.226	4.18	.32
		1938		Cotton	305.9 lb. s. cat	28.50	3.932	13.80	2.40
	Crop sequence, cotton, corn, cotton, oats	1939		Corn	40.0 bu	19.41	.002	.01	(8)
	Data from January 1932 to Nov. 1, 1939	7.8-year average				32.42	3.636	11.22	2.27

See footnotes at end of table.

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
Terrace C-13 [10]	Area, 3.937 acres. Length, 1,930 feet. Vertical interval, 3.9 feet. Grade, 0-3 inches per 100 feet, variable. Land slope, 4.4 percent. Soil, 51 percent Houston black clay, 49 percent Austin clay. Crop sequence, permanent strip oats, cotton, corn, rotated 2 years.	1940	Oats	Oats Cotton	22.1 bu. 400.0 lb. s. cat.	42.30	6.452	15.25	1.11
		1941	Oats	Oats Corn	11.4 bu. 27.4 bu.	40.86	6.393	15.65	1.30
	Data from January 1940 to December 1941	2-year average				41.58	6.423	15.45	1.21
Terrace C-14 [10]	Area, 4.565 acres. Length, 1,885 feet. Vertical interval, 4.1 feet. Grade, 0-3 inches per 100 feet, variable. Land slope, 3.9 percent. Soil, 64 percent Houston black clay, 36 percent Austin clay. Crop sequence, 2-yr. rotation, cotton corn.	1940		Cotton	282.0 lb. s. cat.	42.30	8.175	19.33	2.19
		1941		Corn	20.7 bu.	40.86	9.747	23.85	2.98
	Data from January 1940 to December 1941	2-year average				41.58	8.961	21.55	2.59
Terrace C-15 [10]	Area, 4.186 acres. Length, 1,865 feet. Vertical interval, 3.8 feet. Grade, 4 inches per 100 feet. Land slope, 3.9 percent. Soil, 85 percent Houston black clay, 15 percent Austin clay. Crop sequence, 2-yr. rotation cotton, corn.	1940		Cotton	359.0 lb. s. cat.	42.30	7.565	17.88	2.15
		1941		Corn	24.6 bu.	40.86	9.168	22.44	2.65
	Data from January 1940 to December 1941	2-year average				41.58	8.367	20.12	2.40
Terrace C-16 [10]	Area, 5.021 acres. Length, 1,877 feet. Vertical interval, 3.4 feet. Grade, 4 inches per 100 feet. Land slope, 2.9 percent. Soil, 92 percent Houston black clay, 8 percent Austin clay. Crop sequence, permanent oat strip, cotton, corn. 2-year rotation.	1940	Oats	Oats Cotton	28.1 bu. 383.0 lb. s. cat.	42.30	7.940	18.77	.93
		1941	Oats	Oats Corn	38.2 bu. 30.1 bu.	40.86	6.375	15.60	1.40
	Data from January 1940 to December 1941	2-year average				41.58	7.158	17.22	1.17

Terrace E-2	Area, 1.62 acres; Length, 696 feet; Vertical interval, 2.5 feet; Grade, 3 inches per 100 feet; Land slope, 2.5 percent; Soil, 100 percent Houston clay; Crop sequence, cotton, cotton, corn	1933		Cotton	154.4 lb. s. cat	15.80	2.943	[5] 18.63	2.22
		1934		do	191.9 lb. s. cat	29.66	5.718	19.28	5.16
		1935		Corn	22.2 bu	44.84	9.286	20.71	8.35
		1936		Cotton	538.3 lb. s. cat	39.38	4.422	11.23	2.69
	Data from Apr. 26, 1933, to Dec. 31, 1936.	3.6-year average				36.02	6.214	17.25	5.12
Terrace W-2	Area, 1.63 acres; Length, 653 feet; Vertical interval, 2.5 feet; Grade, 3 inches per 100 feet; Land slope, 2 percent; Soil, 100 percent Houston clay; Crop sequence, cotton, cotton, corn	1933		Cotton	145.2 lb. s. cat	15.80	2.656	16.81	2.54
		1934		do	239.9 lb. s. cat	29.66	5.412	18.25	7.08
		1935		Corn	21.7 bu	44.84	10.827	24.14	10.69
		1936		Cotton	520.9 lb. s. cat	39.38	7.356	18.68	5.84
	Data from Apr. 26, 1933, to Dec. 31, 1936	3.6-year average				36.02	7.292	20.24	7.26
O-1	Area, 1.5 acres, 151 by 432 feet; Land slope, 2.31 percent; Soil, 100 percent Houston black clay, 3-year rotation, cotton, oats, corn.; Guide lines 108 feet apart; Rows on contour	1939	Oats	Oats	29.82 bu	22.96	(1)		
		1940		Corn	39.60 bu	40.56	.772	1.90	.74
		1941		Cotton	948.0 lb. s. cat	41.85	1.721	4.11	2.48
		3-year average				35.12	.831	2.37	1.07
O-2	Area, 1.5 acres, 151 by 432 feet; Land slope, 1.85 percent; Soil, 100 per cent Houston black clay; 3-year rotation cotton, oats, corn; Guide lines 108 feet apart; Rows on contour	1939		Corn	32.71 bu	22.96	.034	.15	.02
		1940		Cotton	687.0 lb. s. cat	40.56	1.629	4.02	.65
		1941	Oats	Oats	60.6 bu	41.85	3.224	7.70	.90
		3-year average				35.12	1.629	4.64	.52
O-3	Area, 1.5 acres, 151 by 432 feet; Land slope, 2.08 percent; Soil, 100 percent Houston black clay; 3-year rotation, cotton, oats, corn; Strip-cropped 36-foot strips; Guide lines 108 feet apart; Rows on contour	1939	Oats	Oats	28.16 bu				
				Cotton	566 lb. s. cat				
				Corn	34.61 bu	22.96	.066	.29	.10
		1940		do	34.8 bu				
			Oats	Oats	20.93 bu				
				Cotton	456 lb. s. cat	40.56	1.087	2.68	.25
		1941		do	621 lb. s. cat				
				Corn	35.7 bu				
			Oats	Oats	56.8 bu	41.85	2.061	4.92	.56
		3-year average				35.12	1.071	3.05	.30

See footnotes at end of table.

TABLE 17.—*Annual summary of rainfall, runoff, and soil loss for all areas under measurement at the Blackland Soil and Water Conservation Experiment Station, Temple, Tex., for the period of record during 1931–41, inclusive*—Continued

Plot or watershed	Plot or watershed characteristics and treatments	Year	Winter cover	Crop harvested	Yield of crop per acre	Rainfall	Depth of runoff	Runoff in percentage of rainfall	Soil loss per acre
						Inches	*Inches*	*Percent*	*Tons*
O-3	Area, 1.5 acres, 151 by 432 feet								
	Land slope, 2.08 percent								
	Soil, 100 percent Houston black clay	1939		Cotton	795.33 lb. s. cat	22.96	0.289	1.26	0.27
	3-year rotation, cotton, oats, corn	1940	Oats	Oats	22.67 bu	40.56	4.171	10.28	1.43
	Guide lines 108 feet apart	1941		Corn	40.2 bu	41.85	3.483	8.32	2.97
	Rows on contour								
		3-year average				35.12	2.648	7.54	1.56
O-5	Area 1.5 acres 151 by 432 feet	1939		Corn	33.68 bu				
	Land slope, 2.31 percent		Oats	Oats	29.38 bu				
	Soil, 100 percent Houston black clay			Cotton	558.41 lb. s. cat	22.96	.119	.52	.18
	3-year rotation, cotton, oats, corn	1940		do	542.0 lb. s. cat				
	Strip-cropped, 36-foot strips			Corn	33.5 bu				
	Guide lines 108 feet apart		Oats	Oats	26.79 bu	40.56	1.287	3.17	.86
	Rows on contour	1941		do	62.8 bu				
				Cotton	629.62 lb. s. cat				
				Corn	37.2 bu	41.85	2.285	5.45	1.02
		3-year average				35.12	1.230	3.50	.69
O-6	Area, 1.5 acres 151 by 432 feet	1939		Cotton	596.38 lb. s. cat				
	Land slope, 1.39 percent			Corn	32.94 bu				
	Soil, 100 percent Houston black clay			Oats	34.74 bu	22.96	.007	.03	(8)
	3-year rotation, cotton, oats, corn	1940		do	28.38 bu				
	Strip-cropped, 36-foot strips			Cotton	639.0 lb s. cat				
	Guide lines 108 feet apart			Corn	37.0 bu	40.56	3.496	8.62	.78
	Rows on contour	1941		do	34.0 bu				
				Oats	44.2 bu				
				Cotton	828.94 lb. s. cat	41.85	3.861	9.23	1.20
		3-year average				35.12	2.455	6.99	.66
P-1	Area, 1.5 acres 151 by 432 feet								
	Land slope, 2.31 percent	1939		Cotton	786.7 lb. s. cat	22.78	.743	3.26	.89
	Soil, 100 percent Houston black clay	1940		Oats	23.33 bu	40.45	4.387	10.85	2.95
	3-year rotation, cotton, oats, corn	1941		Corn	39.3 bu	41.32	5.148	12.46	5.87
	Guide lines 108 feet apart								
	Rows on contour								
		3-year average				34.85	3.426	9.83	3.24

P-2	Area, 1.5 acres 151 by 432 feet; Land slope, 2.31 percent; Soil, 100 percent Houston black clay; 3-year rotation, cotton, oats, corn; Strip-cropped 36-foot strips; Guide lines 108 feet apart; Rows on contour			Corn	35.39 bu				
		1939	Oats	Oats	42.0 bu				
				Cotton	612.12 lb. s. cat	22.78	.049	.22	.07
				do	572.0 lb. s. cat				
		1940		Corn	34.3 bu				
			Oats	Oats	19.48 bu	40.45	3.659	9.05	1.20
				do	33.3 bu				
		1941		Cotton	554.02 lb. s. cat				
				Corn	36.6 bu	41.32	3.678	8.90	2.09
		3-year average				34.85	2.462	7.06	1.12
P-3	Area, 1.5 acres 151 by 432 feet; Land slope, 2.78 percent; Soil, 77 percent Houston black clay, 23 percent Austin clay.; 3-year rotation cotton, oats, corn; Strip-cropped 36-foot strips; Guide lines 108 feet apart; Rows on contour		Oats	Oats	49.24 bu				
		1939		Cotton	804.0 lb. s. cat				
				Corn	35.92 bu	22.78	.082	.36	.11
				do	32.1 bu				
		1940	Oats	Oats	39.72 bu				
				Cotton	409.0 lb. s. cat	40.45	3.335	8.24	1.45
				do	426.94 lb. s. cat				
		1941		Corn	27.5 bu				
				Oats	57.0 bu	41.32	4.015	9.72	1.61
		3-year average				34.85	2.477	7.11	1.06
P-4	Area, 1.5 acres 151 by 432 feet; Land slope, 3.01 percent; Soil, 44 percent Houston black clay, 56 percent Austin clay.; 3-year rotation, cotton, oats, corn; Guide lines 108 feet apart; Rows on contour	1939		Corn	28.89 bu	22.78	.670	2.94	2.45
		1940		Cotton	561.0 lb. s. cat	40.45	4.576	11.31	13.55
		1941	Oats	Oats	42.7 bu	41.32	4.381	10.60	4.61
		3-year average				34.85	3.209	9.21	6.87
P-5	Area, 1.5 acres 151 by 432 feet; Land slope, 3.01 percent; Soil, 56 percent Houston black clay, 44 percent Austin clay; 3-year rotation cotton, oats, corn; Strip-cropped 36-foot strips; Guide lines 108 feet apart; Rows on contour			Cotton	463.22 lb. s. cat				
		1939		Corn	24.14 bu				
			Oats	Oats	29.56 bu	22.78	.132	.58	.06
				do	31.1 bu				
		1940		Cotton	549.0 lb. s. cat				
				Corn	24.6 bu	40.45	4.386	10.84	4.11
				do	23.7 bu				
		1941		Oats	33.3 bu				
				Cotton	655.55 lb. s. cat	41.32	3.470	8.40	3.40
		3-year average				34.85	2.663	7.64	2.52
P-6	Area, 1.5 acres 151 by 432 feet; Land slope, 3.01 percent; Soil, 90 percent Houston black clay, 10 percent Austin clay.; 3-year rotation cotton, oats, corn; Guide lines 108 feet apart; Rows on contour	1939	Oats	Oats	41.11 bu	22.78	.021	.09	.01
		1940		Corn	26.4 bu	40.45	6.743	16.00	9.97
		1941		Cotton	470.0 lb. s. cat	41.32	5.240	12.68	7.38
		3-year average				34 85	3.911	11.22	5.79

[1] No runoff. [2] No soil loss. [3] No record.
[4] One minor runoff record lost during year.
[5] Some seep water contributed to runoff.
[6] One storm record of runoff faulty, runoff partly estimated for storm.
[7] One major soil or runoff loss, record lost during year. [8] Trace.
[9] Two minor runoff records lost during year. [10] Terraces redesigned for new project.

TABLE 18.—*Average monthly rainfall, runoff, and soil loss, control plot 3, continuous corn, for 11-year period, 1931–41*

Month	Rainfall	Runoff	Soil loss per acre	Month	Rainfall	Runoff	Soil loss per acre
	Inches	*Inches*	*Tons*		*Inches*	*Inches*	*Tons*
January	2.93	0.31	1.48	July	3.01	0.63	2.90
February	2.27	.07	.23	August	1.09	.15	1.06
March	2.09	.19	1.02	September	2.71	.26	.61
April	3.10	.56	2.67	October	2.00	.02	.14
May	4.13	1.07	5.05	November	2.93	.34	2.60
June	3.46	.64	2.05	December	3.33	.24	.50

TABLE 19.—*Infiltration rates under different covers as obtained by type D–1 rainfall simulator* [1]

Cover	Soil	Land slope	Soil moisture	Time of constant infiltration rate	Constant infiltration rate	Maximum runoff rate in percentage of rainfall
		Percent	*Percent*	*Minutes*	*Inch per hour*	*Percent*
Wet fallow	Austin clay	3.6	20.96	15	0.40	88
Do	do	3.6	23.54	16	.25	92
Do	Austin clay, shallow phase.	3.6	22.20	34	.47	86
Do	do	3.6	20.72	34	.59	82
Do	Austin clay	3.6	23.24	74	.39	88
Wet oat mulch, 2 tons per acre.	do	3.6	23.16	19	.51	85
2nd wet oat mulch, 2 tons per acre.	do	3.6	21.94	46	.51	85
Wet oat mulch, 2 tons per acre.	do	3.6	22.51	20	.51	85
2nd wet oat mulch, 2 tons per acre.	do	3.6	23.47	24	.51	85
Wet Bermuda sod	Houston black clay	3.8	29.20	44	.19	94
Do	do	3.8	33.24	30	.14	96
Wet native meadow	do	3.8	34.71	24	.08	98
Do	do	3.8	32.77	28	.27	92
Wet Buffalo sod	do	3.8	34.86	34	.08	98
Do	do	3.8	33.43	42	.19	94

[1] Ground wet from run 24 hours earlier. Rate of water application 3.3 inches per hour. Moisture samples taken immediately before run.

TABLE 20.—*Grasses under observation at the station, their local adaptability and possible conservation uses*

Scientific name	Common name	Adaptability	Possible conservation uses and other notes
Agropyron cristatum (L.) Beauv.	Crested wheatgrass	Poor	Susceptible to drought.
Agropyron pauciflorum (Schwein.) Hitchc.	Slender wheatgrass	do	Do.
Agropyron repens (L.) Beauv.	Quackgrass	do	Killed by dry, hot summer.
Agropyron smithii Rydb.	Bluestem	do	Susceptible to rust and drought.
Agropyron tenerum Vasey	Western rye or slender wheat.	do	Susceptible to drought.
Agrostis alba L.	Redtop	do	Local seed have low viability.
Agrostis palustris Huds.	Creeping bentgrass	Good	Waterways—slow starting.
Agrostis tenuis Sibth.	Colonial bentgrass	do	Waterways.
Agrostis pauciflora Pursh		Unknown	No germination.
Alopecurus pratensis L.	Meadow foxtail	Poor	Susceptible to drought.
Andropogon annularis	Angleton bluestem	Good	Hay-pasture, susceptible to cold, revegetation.
Andropogon barbinodis Lag.	Cane beardgrass	Poor	Reseeding poor.
Andropopgon furcatus Muhl.	Bluejoint turkeyfoot	Good	Native grass, hay, revegetation.
Andropogon glomeratus (Walt.) B. S. P.	Bushy beardgrass	Poor	Local seed have low viability.
Andropogon halli Hack.	Turkeyfoot	do	Hay, stemmy, coarse.
Andropogon intermedius	Australian bluestem	Good	Native grass, hay, revegetation.
Andropogon ischaemum	East Indies bluestem	do	Hay, pasture, revegetation.

TABLE 20.—*Grasses under observation at the station, their local adaptability and possible conservation uses*—Continued

Scientific name	Common name	Adaptability	Possible conservation uses and other notes
Andropogon littoralis Nash		Good	Var. little bluestem, hay—revegetation.
Andropogon saccharoides Swartz	Silver beardgrass	do	Of little value, revegetation.
Andropogon scoparius Michx	Prairie beardgrass	do	Native grass, hay, pasture, revegetation.
Arrhenatherum elatius (L.) Mert. and Koch.	Tall oatgrass	Poor	Susceptible to drought.
Astrebla elymoides Muell	Hoop mitchellgrass	do	Local seed have low viability.
Astrebla lappacea Domin	Curly mitchellgrass	do	Do.
Axonopus compressus (Swartz) Beauv.	Carpet grass	do	Susceptible to drought.
Bouteloua curtipendula (Michx.).	Side-oats grama	Good	Native grass, hay, some pasturage, revegetation.
Bouteloua eriopoda (Torr.) Torr.	Black grama	Poor	Local seed have low viability.
Bouteloua filiformis (Fourn.) Griffiths.	Slender grama	do	Do.
Bouteloua gracilis (H. B. K.) Lag.	Blue grama	do	Do.
Bouteloua hirsuta Lag	Hairy grama	do	Do.
Bouteloua rigidiseta (Steud.) Hitchc.	Texas grama	do	Do.
Bromus catharticus Vahl	Rescue grass	Excellent	Annual winter grazing.
Bromus inermis Leyss	Smooth brome	Good	Fair for pasture.
Bromus marginatus Nees		Poor	Poor germination.
Bromus unioloides (H. B. K.)	Schrader's bromegrass	see B-Catharticus.	Same as B. Catharticus.
Buchloe dactyloides (Nutt.) Engelm.	Buffalo grass	Excellent	Native grass, pasture—waterways, uplands.
B. dactyloides (36 strains)	do	do	36 selected strains for seeding, growth habits.
Cenchrus biflorus	India sandbur	Poor	Susceptible to cold.
Cenchrus ciliarus		do	Do.
Centaurea jacea		Unknown	No germination.
Chamiza	Fourwing saltbush	do	Do.
Chloris berroi	Argentine chloris	Poor	Low germination.
Chloris gayana Kunth	Rhodes grass	do	Susceptible to cold.
Chloris gayana (30 strains)	do		30 selected strains for cold resistance, some pasturage—slight cold resistance.
Chloris petraea Swartz		Good	Do.
Chloris virgata Swartz	Feather fingergrass	Poor	Susceptible to cold.
Cynodon dactylon (L.) Pers	Bermuda grass	Excellent	Waterways—pastures, revegetation, lowlands.
Cynodon dactylon	Dwarf bermuda	do	Do.
Cynodon dactylon maritimus	St. Lucie grass	Poor	Susceptible to drought and cold.
Dactylis glomerata L	Orchard grass	Good	Hay, some pasturage, revegetation.
Digitaria eriantha	Wooly fingergrass	do	Some pasturage, no seed available.
Digitaria seriata	Inkruip 24-5 sel	Unknown	No germination.
Digitaria swazilandensis	Swaziland fingergrass	Poor	Susceptible to cold.
Ehrhartia calycina		Poor	Susceptible to cold.
Elymus canadensis	Canada wild-rye	Good	Winter grazing—susceptible to rust, revegetation.
Eragrostis curvula (Schrad.)	Weeping lovegrass	do	Some grazing, revegetation.
Eremochloa ophiuroides (munro).	Centipede grass	Poor	Susceptible to cold.
Festuca elatior	Early meadow fescue	Good	Hay—some pasturage, winter, revegetation.
Festuca elatior (5 strains)	do	do	5 selected strains.
Festuca elatior pratensis	Tall fescue	do	Hay—some pasturage, winter, revegetation.
(Festuca elatior) (var. arundinacea).	do	do	Do.
Festuca ovina L	Sheep fescue	Poor	Poor reseeding, no spread.
Festuca rubra L	Red fescue	do	Susceptible to drought.
Festuca rubra (var. commutata) Gand.	Chewings fescue	do	Do.
Hilaria belangeri (Steud.) Nash	Curly mesquite	Good	Native grass, pasture, revegetation.
Hilaria jamesii (Torr.) Benth	Galleta grass	do	Some grazing, revegetation.
Lolium multiflorum	Italian ryegrass	do	Annual—winter grazing.
Lolium multiflorum (3 strains)	do	do	3 selected strains, winter grazing.
Lolium perenne L	English or Perennial ryegrass.	Unknown	Planted, fall 1941.
Lolium perenne (3 strains)	Perennial ryegrass	do	3 selected strains.
Lycurus phleoides H. B. K	Wolftail	do	No germination.
Matricaria tchihatchewi	Turfingdaisy	do	Do.
Melinis minutifloria Beauv	Molasses grass	Poor	Poor germination.

TABLE 20.—*Grasses under observation at the station, their local adaptability and possible conservation uses*—Continued

Scientific name	Common name	Adaptability	Possible conservation uses and other notes
Mesembryanthemum crystallinum.	Iceplant	Poor	Susceptible to cold.
Muhlenbergia porteri Scribn	Bush muhly	do	Susceptible to drought.
Muhlenbergia repens (Presl.) Hitchc.	Creeping muhly	Good	Gully control, little grazing value.
Muhlenbergia utilis (Torr.) Hitchc.	Aparejo grass	do	Do.
Oryzopsis hymenoides	Indian ricegrass	Poor	Susceptible to drought.
Panicum Antidotale	Blue witchgrass	Good	Hay, some grazing, revegetation
Panicum combsii. Scribn. and Ball.		Poor	Susceptible to cold.
Panicum maximum Jacq	Guinea grass	Unknown	No germination.
Panicum obtusum H. B. K	Vine-mesquite	Good	Of little value, revegetation.
Do	do	do	Hay, some grazing, revegetation.
Panicum virgatum	Switchgrass	Excellent	Rank growing, revegetation.
Paspalum dilatatum Poir	Dallis grass	Good	Grazing, revegetation.
Paspalum distichum L	Knotgrass	do	Of little value.
Paspalum floridanum Michx		do	Some grazing, revegetation.
Paspalum hartwegianum Fourn		Poor	Poor spreading.
Paspalum lividum Trin	Longtom	Good	No seed available.
Paspalum malacophyllum	Ribbed paspalum	do	Hay, some grazing, revegetation.
Paspalum notatum Flugge	Bahia grass	Poor	Some grazing, revegetation.
Paspalum notatum	Paraguay Bahia	Good	Possible grazing, revegetation.
Paspalum pubiflorum Rupr		Poor	No seed available, poor spread.
Paspalum vaginatum 918	Seashore paspalum	do	Susceptible to cold.
Paspalum virgatum L	Talquezal	Unknown	No germination.
Pennisetum purpureum Schumach.	Napier or elephant grass	do	Do.
Phalaris arundinacea L	Reed canary grass	do	Hay, some winter grazing, revegetation.
Phalaris tuberosa var. Stenoptera (Hack.) Hitchc.	Toowoomba canary grass.	Excellent	Winter grazing, hay, revegetation.
Phleum pratense L	Timothy	Poor	Susceptible to drought.
Poa arachnifera Torr	Texas bluegrass	Good	From sets only, no seed available.
Poa bulbosa L	Bulbous bluegrass	Poor	Poor germination.
Poa compressa L	Canada bluegrass	do	Do.
Poa pratensis L	Kentucky bluegrass	do	Do.
Poa trivialis L	Rough-stalked meadow grass.	do	Susceptible to drought.
Polytrias praemorsa	Java grass	Poor	Sodded, slow growth.
Sorghastrum nutans (L.) Nash	Indian grass	Good	Native grass, hay, revegetation
Sporobolus airoides (Torr.) Torr	Alkali sacaton	Poor	Poor spread.
Sporobolus asper (Michx.) Kunth.		Good	Hay, some grazing, revegetation.
Sporobolus asper var. hookeri (Trin.) Vasey.		do	Do.
Sporobolus cryptandrus (Torr.) A. Gray.	Sand dropseed	Poor	Poor germination.
Sporobolus texanus Vasey	Texas dropseed	Good	Some grazing, revegetation.
Stenotaphrum secundatum (Walt.) Kuntze.	St. Augustine grass	do	Sodded, needs shade and water.
Tricholaena rosea Nees	Natal grass	do	Ornamental, susceptible to cold.
Triodia flava (L.) Smyth	Purpletop	Poor	Poor spread.
Tripsacum dactyloides (L.) L	Eastern gamagrass	Unknown	No germination.
Zoysia japonica Steud	Korean lawngrass	Poor	Sodded, short grass.
Zoysia Spp	African lawngrass	do	Do.
Zoysia tenuifolia Willd	Korean velvetgrass	do	Do.

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